

Typhoon/Tempest

in action



 Aircraft Number 102
squadron/signal publications

Typhoon/Tempest

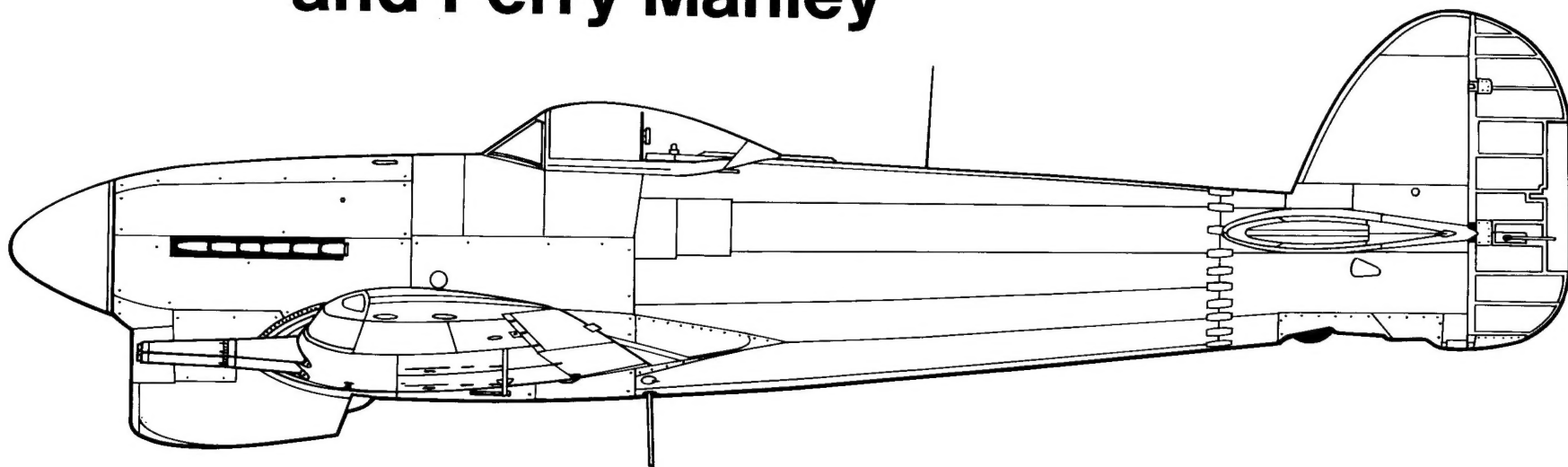
in action

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Illustrated by Joe Sewell

and Perry Manley



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A pair of rocket armed Typhoon 1Bs of No. 198 Squadron prepare to make another pass at a German armored column. Typhoon squadrons formed an important part of the ground attack force assigned to the 2nd Tactical Air Force after D-Day.

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Dedication

To all Typhoon and Tempest pilots, past and present.

Acknowledgements

The photographs used in this book were kindly supplied by the following organizations and individuals. To all, I extend my grateful thanks.

Dick Ward
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British Aerospace
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Aeroplane Monthly
Dave Howley
Michael Oakey

This Typhoon 1B of No 183 Squadron is a late production aircraft with all the modifications made to the Typhoon over its service life including the bubble canopy, whip radio antenna, under wing bomb racks and rear fuselage reinforcement plates.



INTRODUCTION

During the late 1930s and early 1940s, British aircraft designers were pushing programs aimed at developing higher powered engines for military aircraft. This period saw numerous liquid and air cooled powerplants reach the prototype and test stage, although relatively few were to actually go into operational service.

Nowhere was the need for increased engine power and reliability more important than in the design of single seat interceptor fighters. During 1937, Sir Sydney Camm's Hawker design team was encouraged by the potential of a new twenty-four cylinder, liquid cooled engine being developed by the Napier Company under the designation Sabre. The engine promised to deliver more than 2,000 horsepower using a flat-H configuration with sleeve valves. The upper and lower light alloy blocks each had twelve opposed cylinders with three inlet and two exhaust ports, along with four-port sleeves. A two-speed supercharger, four stroke updraught carburetor and Coffman starter were also part of the engine's equipment.

During April of 1937, Hawker submitted a proposal to the Air Ministry for a new fighter to be powered by the Sabre engine and armed with twelve Browning .303 machine guns. As a precaution against the failure of the Sabre program, the design was able to take an alternative power plant, the Rolls-Royce Vulture, with few structural changes. At Hawker, the Sabre engined prototype was known as the Type R and the Vulture powered prototype was the Type N.

Using Hawker's unique steel and duralumin tube method of construction, the two prototypes emerged as low wing monoplanes, featuring monocoque fuselages with flush-riveted light alloy skinning. The wings had slight anhedral in the inner wing panels and dihedral in the outer wing panels, giving the aircraft a slight gull wing appearance. The wings featured metal covered ailerons and split trailing edge flaps. Fuel tanks were built into the wing leading edges and a spacious gun bay was installed just outboard of the inward retracting landing gear.

Entry to the cockpit was through a car type door on each side of the fuselage. The elevators were metal covered, although the rudder was covered in fabric.

Tornado

By the Fall of 1939, construction of the Type R prototype was ahead of the type N prototype because of delays with delivery of the Sabre engine. As a result, the Rolls-Royce Vulture powered aircraft (serialized P5219) was the first to fly and was given the name Tornado.

Completed at Hawker's main facility at Kingston, Surrey, the Tornado prototype was moved by road to Langley Aerodrome at Buckinghamshire. There, Philip Lucas, Hawker's experimental test pilot, took off on its maiden flight on 6 October 1939. The Tornado prototype differed from the Type R prototype (now named the Typhoon) primarily in having the radiator mounted under the wing center section, similar to the Hurricane. The Tornado also featured two rows of exhaust stacks on each side of the cowl.

It was a little ironic that the Rolls-Royce Vulture engine gave comparatively little trouble when installed in the Tornado fighter—in contrast to its record as the power plant of the Manchester bomber. An X configuration engine, with four Rolls-Royce Peregrine engine blocks, the Vulture had a single shaft (the Sabre had two) and twenty-four cylinders. By March of 1941, the engine was developing 2,010 hp, although there were frequent connecting rod failures.

Tests showed that the massive radiator mounted under the wing center section



The Hawker Tornado prototype (P5219) was powered by a Rolls-Royce Vulture engine and featured two rows of exhaust stacks on either side of the nose. The prototype made its first flight on 6 October 1939.

severely restricted the Tornado's performance and Hawker relocated the radiator under the nose. The prototype was modified to this new configuration and began testing on 6 December.

Following an Air Ministry Intention to Proceed with both Typhoon and Tornado production, A. V. Roe was selected to build the Tornado in a new factory at Yeadon, near Leeds. Delays caused by the Battle of Britain forced a slowdown of the Tornado's development and the second prototype (serial P5224) did not fly until 5 December 1940. This aircraft featured an enlarged rudder and two small windows in the solid fairing behind the cockpit. Like the first prototype, P5224 was unarmed although there was provision for four 20MM cannons to be mounted in the wings.

During March of 1941, both Tornado prototypes were fitted with the improved 1,980 hp Vulture V engine. Performance and handling trials were conducted later that year and on 29 August, the first production aircraft (serial R7936) was flown. Intended to be the first of some 200 production aircraft, R7936 was, in fact, followed by only two

The Tornado prototype was later modified with the radiator being relocated under the nose. The aircraft also featured two small windows in the solid fairing behind the cockpit. Like all RAF experimental aircraft, the prototype carried bright yellow undersurfaces.



additional prototypes. The third prototype (HG641) flew on 23 October 1941 and the fourth example (R7938) was transferred to Rolls-Royce for engine trials, but never flew.

All four Tornados led useful lives until finally being struck off charge (SOC). First to be retired was P5219, during August of 1943. The others soldiered on until 1944 and the longest surviving aircraft was P5224, which was not SOC until 20 September 1944. R7936 was used for a series of propeller tests which culminated with the testing of a six-blade contra-rotating Rotol propeller. HG641 was used to test the Bristol Centaurus air-cooled engine and provided valuable data for later programs.

The RAF allocated a total of 1,157 serial numbers for the Tornado, all of which were cancelled when the Air Ministry made a decision to concentrate production on the Typhoon with its Sabre engine.

Typhoon

As 1939 ended, work was progressing on the installation of a Sabre I engine in the Typhoon prototype. On 24 February 1940, the prototype (serialised P5212) made its first flight from Langleigh, again with Philip Lucas at the controls. Both the Typhoon and Tornado prototypes flew a number of early flight tests until the Spring of 1940. On 15 May 1940, Lord Beaverbrook ordered curtailment of any work that might take resources away from the production of Spitfires, Hurricanes and three bomber types.

On 9 May, the Typhoon prototype suffered a partial failure of the monocoque fuselage structure behind the rear of the cockpit. Lucas managed to land the aircraft and was awarded the George Medal for this feat of airmanship. Repairs were quickly made and P5212 returned to flight testing within a month, although the program, because of Ministry of Aircraft Production directives, had been slowed.

Before the second prototype was completed, tests with the first prototype had revealed a number of problems. The most common problem was trouble with the Sabre engine. Overall performance was rated as poor and significantly below what was required for a second generation RAF interceptor. In particular, the Typhoon's performance fell off rapidly above 20,000 feet and its maximum speed was far short of the projected 460 mph.

The Typhoon was, however, extremely strong and able to accommodate an armament of four Hispano 20MM cannons in the wing along with the necessary ammunition feed mechanism and the ammunition itself. Initial air firing trials were conducted with an armament of twelve Browning .303 machine guns, pending the availability of adequate supplies of the French-designed Chatellerault ammunition belt feed system now being built by British sources.

Because of its early performance figures, the Typhoon became a fighter looking for a role. When it functioned smoothly, the Sabre engine gave the Typhoon better performance than anything then in RAF service — or more importantly, Luftwaffe service. There were those, however, who felt that the RAF did not need another fighter. Adequate numbers of Spitfires were available to equip the squadrons now forming for offensive operations.

Following the Air Ministry's issuance of an Intention to Proceed for a total of 1,000 aircraft, plans were put in motion to begin production. Initially, over 250 of the first 1,000 aircraft were to be Typhoons, built concurrently with some 500 Tornados. The final 250 aircraft would be built with whichever power plant was deemed to be best. With Hawker's factories fully committed to the production of Hurricanes, Typhoon production was started at Hucclecote in Gloucestershire, where Gloster Aircraft had production facilities that were not being used.



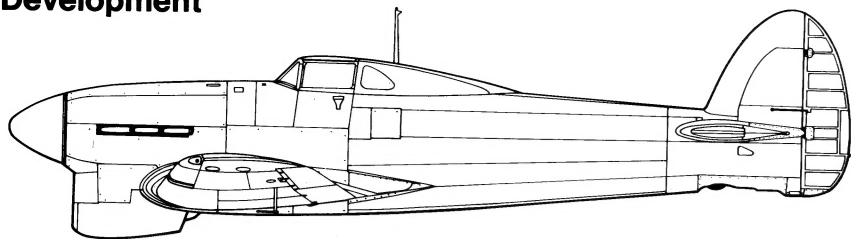
The first Typhoon prototype (P5212) was powered by a 2,020 hp Napier Sabre I engine and made its first flight on 24 February 1940 with Hawker test pilot Philip Lucas at the controls.

On 3 May 1941, the second prototype Typhoon (P5216) flew for the first time and on 27 May, test pilot Michael Daunt took up the first production Typhoon (R7576). Both these machines were fitted with Browning .303 machine guns, although P5216 was later rearmed with four cannons.

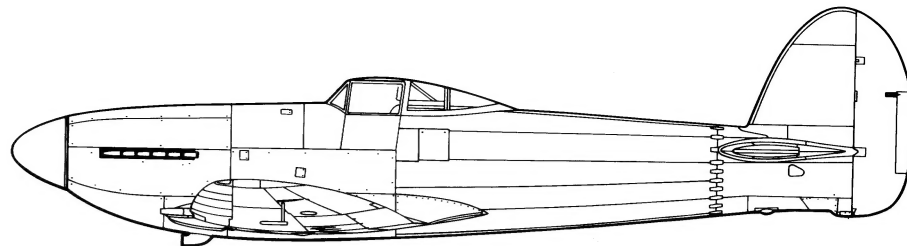
The second Typhoon prototype featured hinged wheel well doors on the landing gear legs, which were deleted on production aircraft in favor of separate doors. The prototype also had small windows mounted in the solid fairing behind the cockpit.



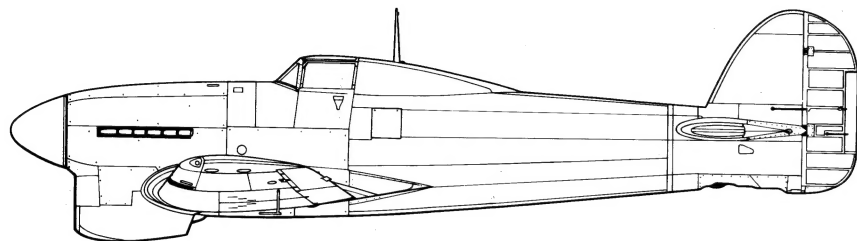
Development



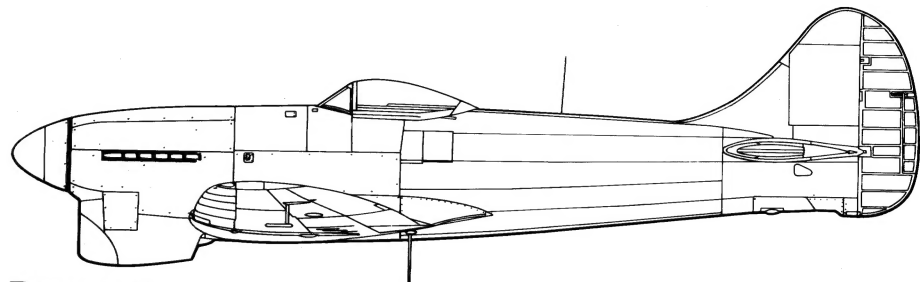
Typhoon Prototype



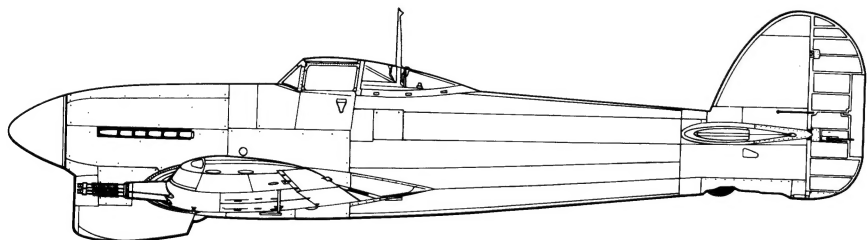
Tempest I



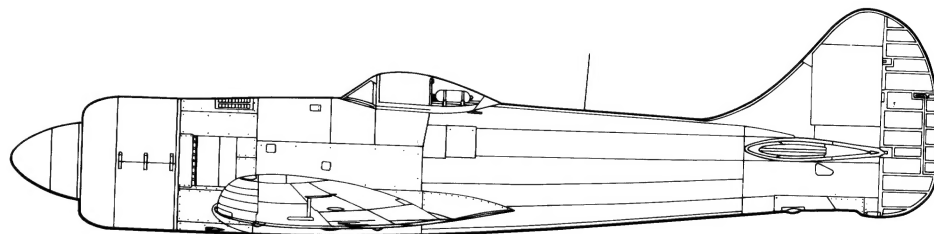
Typhoon IA



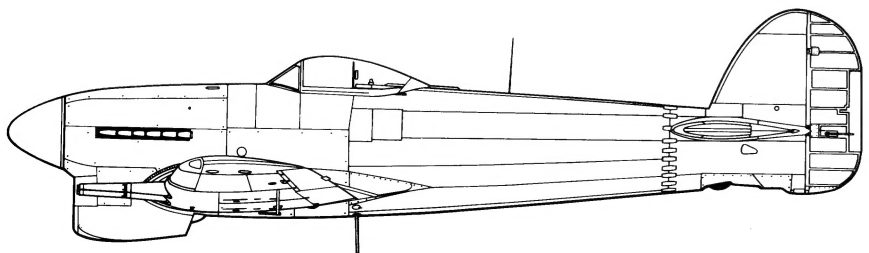
Tempest V



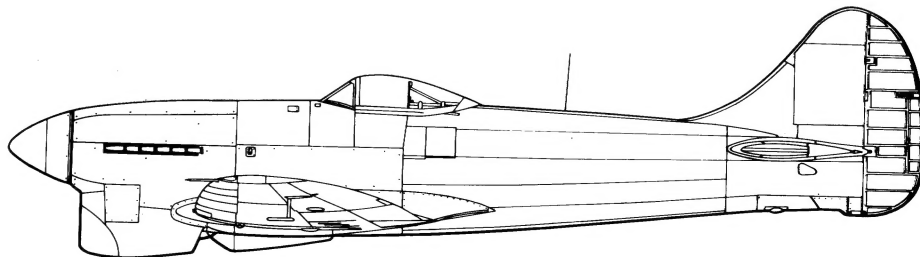
Typhoon IB (Early)



Tempest II



Typhoon IB (Late)



Tempest VI

Typhoon Mk IA

The first Typhoons off the production line differed little from the prototype. The small windows which had been installed on the solid fairing behind the cockpit on the Typhoon prototype were found to have little operational value and were deleted. Like the prototype, the first production Typhoons carried an armament of twelve Browning .303 machine guns and were designated Typhoon Mk IA. A total of 110 Mk IAs were built, although a number of these were later converted to Typhoon IB (four 20MM cannons) standards once adequate supplies of cannons became available.

Pilots reported continuing trouble with the Sabre engine. The power plant had an alarming tendency to catch fire when it was started and it became a standard practice to have a ground crewman standing by with a fire extinguisher when the aircraft was started. The Sabre used a Coffman cartridge starter unit which contained five shotgun-like rounds and used the expansion of explosive gases to turn over the engine. Failure of the engine to catch on the first attempt often led to a fire in the air intake, which was set in the center of the radiator scoop. Prompt action by the ground crew usually prevented a serious fire, although the problem hardly inspired a pilot to have confidence in the Typhoon!

Pre-service testing of the Typhoon IA by the Air Fighting Development Unit, at Boscombe Down and the Central Fighter Establishment, tried to rectify some of the aircraft's faults before the Typhoon was issued to a front line squadron. In the event, most of them were accepted rather than cured. A comprehensive check list was drawn up and it was stressed that one rule be observed at all times — pilot oxygen was to be switched on before anything else. This was to guard against the dangerous buildup of carbon monoxide gas in the cockpit after the engine was started.

Successful engine starts were often at the mercy of the weather. In cold, damp conditions the Sabre was very reluctant to start. The Coffman starter, designed to start the Merlin engines used in the Spitfire and Hurricane, was not really powerful enough to start the Sabre engine in the Typhoon. Eventually the fuel/oil priming mixture was changed to a 70:30 gasoline to oil ratio. This prevented the gasoline from washing the oil out of the cylinders during priming.

When the engine did start, it did not always run evenly. Early Typhoons were prone to numerous engine changes after remarkably few flying hours. Uneven running had to be avoided because wear on the valve sleeves could cause the sleeves to jam and blow up the cylinder. Once a sleeve jammed, a pilot had less than one minute to take appropriate action — bail out or ditch.

Ditching was to be avoided unless absolutely necessary, since the huge radiator scoop took on water very quickly. On the other hand, if the aircraft was belly landed, the strength of the aircraft was such that a pilot could often walk away from a total wreck.

Early Operations

During the Summer of 1941, the RAF prepared to introduce the Typhoon Mk IA into operational service.

Paul Richey, Squadron Leader, Tactics at Fighter Command chose Duxford, in Cambridgeshire, as the first Typhoon base. This was principally because Duxford had a grass runway. One of the problems with early Typhoons was that the brakes were not overly effective. The grass would provide some extra braking effect and reduce the Typhoon's landing run. No 56 Squadron was selected to be the first Typhoon squadron.



This early production Typhoon IA (R7578) lacks the small windows behind the cockpit found on the prototype Typhoon. The aircraft is armed with a total of twelve Browning .303 machine guns, six in each wing.

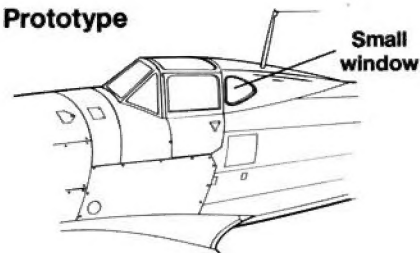
Deliveries of Mk IAs to No 56 Squadron commenced on 26 September 1941 — almost exactly the same time that II/JG 26 completed its re-equipment with the Focke Wulf Fw 190A-1 at Moorseele in Belgium. British intelligence had known for some time that the Luftwaffe was introducing a new fighter and during the week that the Typhoon first entered service, other RAF squadrons reported their first encounters with the Fw 190.

The performance of the new German fighter was excellent and more than equal to that of the Spitfire Mk V. It was the advent of the Fw 190 into Luftwaffe service that helped keep the Typhoon program alive — for there were still many within the RAF that felt the program should be cancelled. As soon as No 56 Squadron had begun operations, pilots began reporting the same problems that had been uncovered during the test programs. Squadron pilot reported problems included: poor engine starting, the ease with which the engine caught fire, deterioration of engine bulkhead seals which led to carbon monoxide seeping into the cockpit, the blistering heat in the cockpit when the Sabre was running properly (but usually at dangerously high oil temperatures) and the poor rearward view from the cockpit. It was no small wonder that the early Typhoons spent long periods on the ground undergoing maintenance.

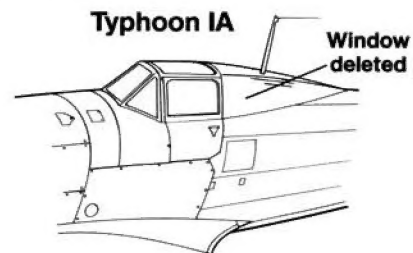
Toward the end of 1941, Hawker began production of Typhoons at both Kingston and Langley, with the first Langley built aircraft making its maiden flight on 26 November 1941. This aircraft (serial R8198) was followed by an additional fourteen before all production was centralized at Hucclecote.

Cockpit Development

Prototype



Typhoon IA



Typhoon Mk IB

Shortly after the Typhoon IA was introduced into service, Hawker began receiving adequate supplies of Hispano cannons to switch production over to a cannon armed variant of the Typhoon under the designation Typhoon Mk IB. The Typhoon IB replaced the twelve .303 Browning machine guns of the Typhoon IA with four belt fed Hispano 20MM cannons. In fact, the suffix letters in the designations of the two aircraft referred to their difference in armament: IA for the twelve machine gun armament and IB for the four cannon armed aircraft.

In addition to the change in armament, Hawker also corrected the problem of rearward visibility from the Typhoon's cockpit. Hawker engineers designed a clear canopy section that replaced the solid fairing on the Mk IA. This section was fixed in place behind the cockpit. The canopy was still made up of five separate sections and the cumbersome car-type doors remained. Since it was not uncommon for these doors to come open in flight, the port side door was usually sealed shut.

Throughout 1942, supplies of Hispano 20MM cannons with the Chatellerault feed improved dramatically. Hawker improved the cannon mounting with the gun barrel now being completely faired. The majority of the Typhoons in service were Mk IBs, including a number of early Typhoon IAs that were retrofitted with cannons and the new clear cockpit fairing. As production of the Typhoon IB increased in tempo, the machine gun armed Mk IAs were quickly replaced and withdrawn from service.

The pilots of No 56 Squadron gradually came to terms with their temperamental mounts and although the complaints and frustrations were widespread, they all voiced an appreciation of how tough the airframe was. The strength of the Typhoon was reflected in the fact that No 56 Squadron lost one pilot in the Fall of 1941 and did not record a second loss until the following June. On the other hand, the first confirmed kill by a Typhoon pilot did not occur until August of 1942.

Gradually, the proper role for the Typhoon emerged. The Typhoon was not to be risked in high altitude dog fights with Luftwaffe fighters, similar to those being undertaken by Spitfires. When the Fw 190's superiority over the Spitfire V was revealed, an intensive program to improve the Spitfire proved to be the real answer to the air superiority problem. The Typhoon could make its mark at lower altitudes, particularly in dealing with the German "hit and run" raiders along the English coast. When everything functioned well, the Typhoon was more than capable of catching any fighter or bomber types the Luftwaffe used on these raids. Even though it was the appearance of the Fw 190 that had helped keep the Typhoon in service, it was more than a year after the type entered service with the RAF before the first Fw 190 was confirmed by a Typhoon pilot, on 17 October 1942.

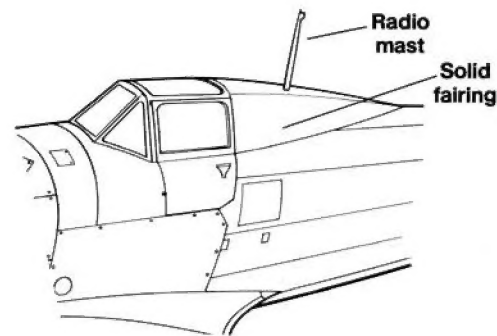
Typhoon pilots had a number of operational hazards to contend with: engine failures, compressibility, structural failures and mistaken identity. From certain angles the Typhoon Mk I closely resembled the Fw 190 and to the lists of losses from crash landings, takeoff accidents and in-flight fires, another statistic was soon added — shot down by Spitfires. There were others who also mistook Typhoons for Fw 190s, particularly U.S. Army Air Force pilots, but Spitfires were the most numerous fighters at the time of the Typhoon's operational debut and at least four are known to have been shot down by Spitfires before the end of August 1942. A number of attempts were made to make Typhoons more easily identifiable, including painting the forward fuselage White and applying chordwise Yellow bands around the wing surfaces. It was not until the end of 1942 that success was finally achieved, by applying Black and White stripes to the wing under-surfaces.



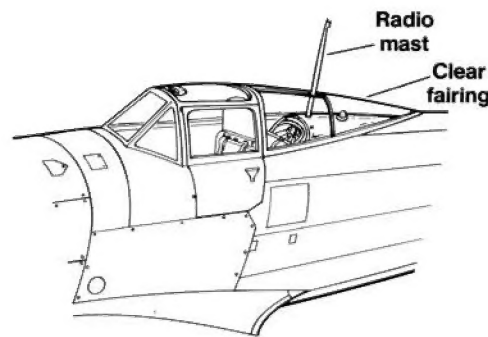
This early Typhoon IB is armed with four Hispano 20MM cannons with unfaired gun barrels, similar to the mounting found on the Hawker Hurricane IIC. The solid fairing behind the cockpit has been replaced by a fixed clear fairing which greatly improved the pilot's rearward view.

Canopy Development

Typhoon IA



Typhoon IB



Pilots new to a Typhoon squadron were warned that while they flew a potent aircraft, it had one or two nasty tendencies, including shedding its tail section. This alarming trait had been hard to trace, for few aircraft had ever returned with any evidence of structural failure, which was understandably suspected to be the cause of the tail failures. In the event, no one cause was ever found to be the reason some Typhoons lost their tails, although failure of the elevator mass balance mount was known to be a contributory cause.

Elevator flutter at high speeds imposed catastrophic loads on the tail section, which broke at the rear fuselage transport joint. Test rigs designed to shake a Typhoon tail to destruction more or less reinforced this theory and as a precaution, the fuselage transport joint was strengthened by twenty fish plates being riveted around the outside of the fuselage. This did not completely solve the problem and tail losses still occurred, even on Typhoons treated with Mod 286 (as the riveting operation was designated). A total of at least twenty-six Typhoons are known to have been lost because of tail failures during the war, although no inherent structural weakness was ever discovered. An individual Typhoon could be thrown into a 500 mph plus dive in perfect safety, while another, configured exactly the same, would fall victim to tail failure.

During early 1943, a Typhoon IB (serial R8809) became the first Typhoon to be fitted with a tear drop or bubble canopy. The aircraft was also modified with a whip antenna replacing the solid mast antenna and the fuselage car type doors were deleted. The sliding canopy became a standard production feature on late production Typhoon IBs, although a number of older aircraft retained the original "coffin-hood" canopy. These Typhoons were retained by some squadrons until after D-Day and some were flying on second line duties until the war's end.

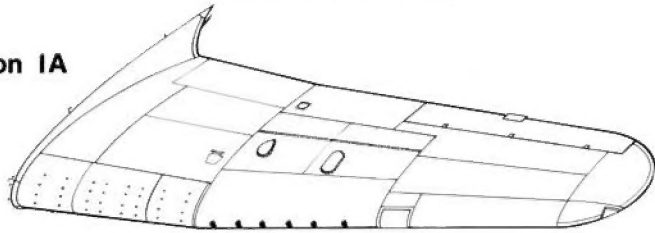
Tests proved that Black and White wing stripes worked best to make the Typhoon recognizable and instructions were issued to paint Typhoons with the stripes on 19 November 1942. The original order called for Black stripes, the White areas not being ordered until 5 December 1942.



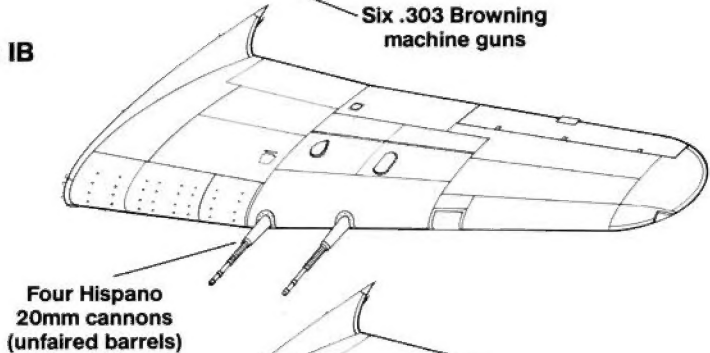
A Typhoon IB (EJ967) of No 193 Squadron prepares to taxi from its dispersal parking spot at Harrowbeer, Devon, during March of 1943. The aircraft has Black and White stripes on the wing undersurface which were added to the Typhoon as a recognition aid.

Armament Development

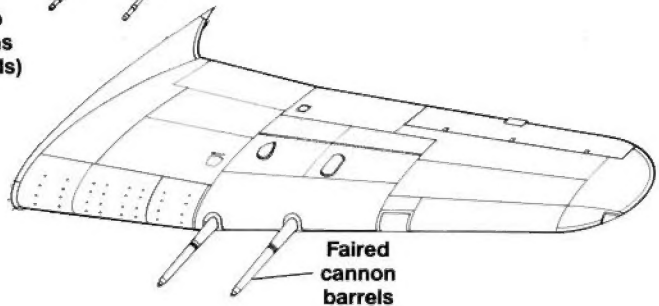
Typhoon IA

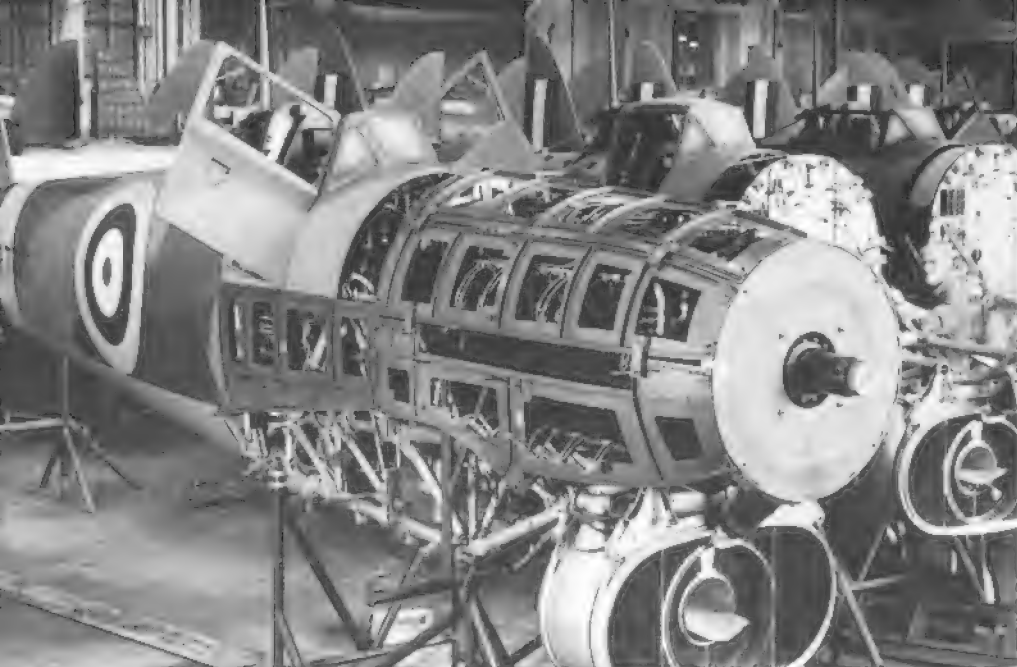


Typhoon IB (Early)



Typhoon IB (Late)





These Typhoons on the production line reveal the heavy mounting for the Sabre engine, cockpit car-door type hatch and undernose radiator with its oval housing. These aircraft are part of the first Typhoon production contract.



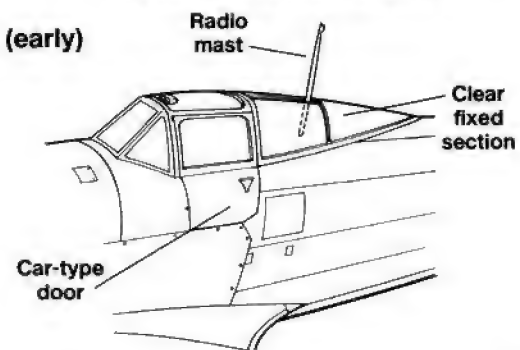
A number of British aircraft were paid for by public subscription during the war. This Typhoon IB was purchased by the citizens of the borough of Sutton and Cheam in Surrey and carries a presentation inscription and coat of arms painted on the port cockpit entry door.

This Typhoon IB (JP128) of No 183 Squadron was flown by Merrick Hyman. The aircraft has the bubble canopy, fish plate reinforcements and whip antenna identifying it as a late production Typhoon IB.

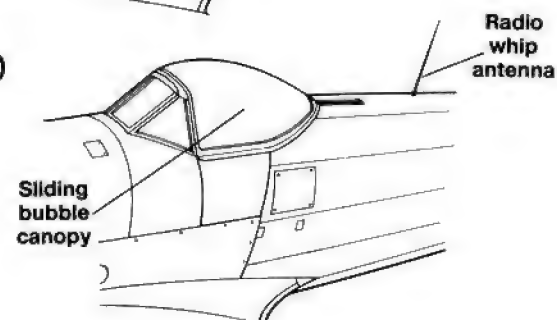


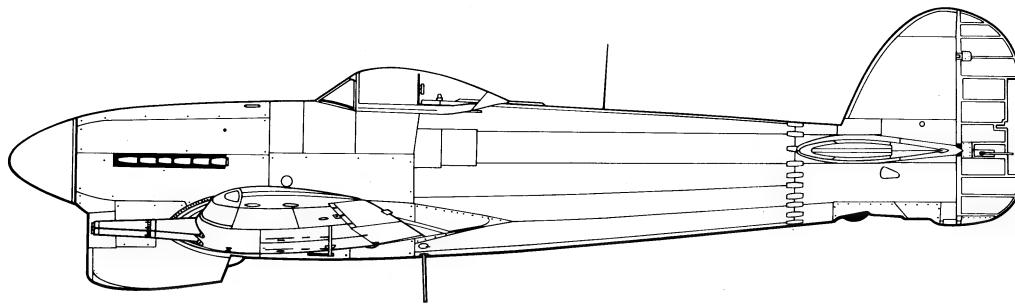
Canopy Development

Typhoon IB (early)



Typhoon IB (late)





Specifications

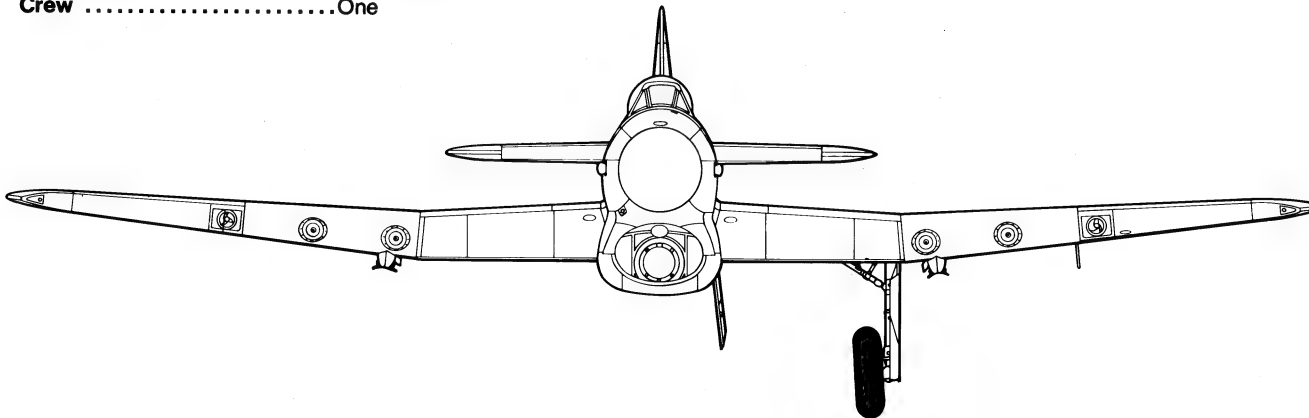
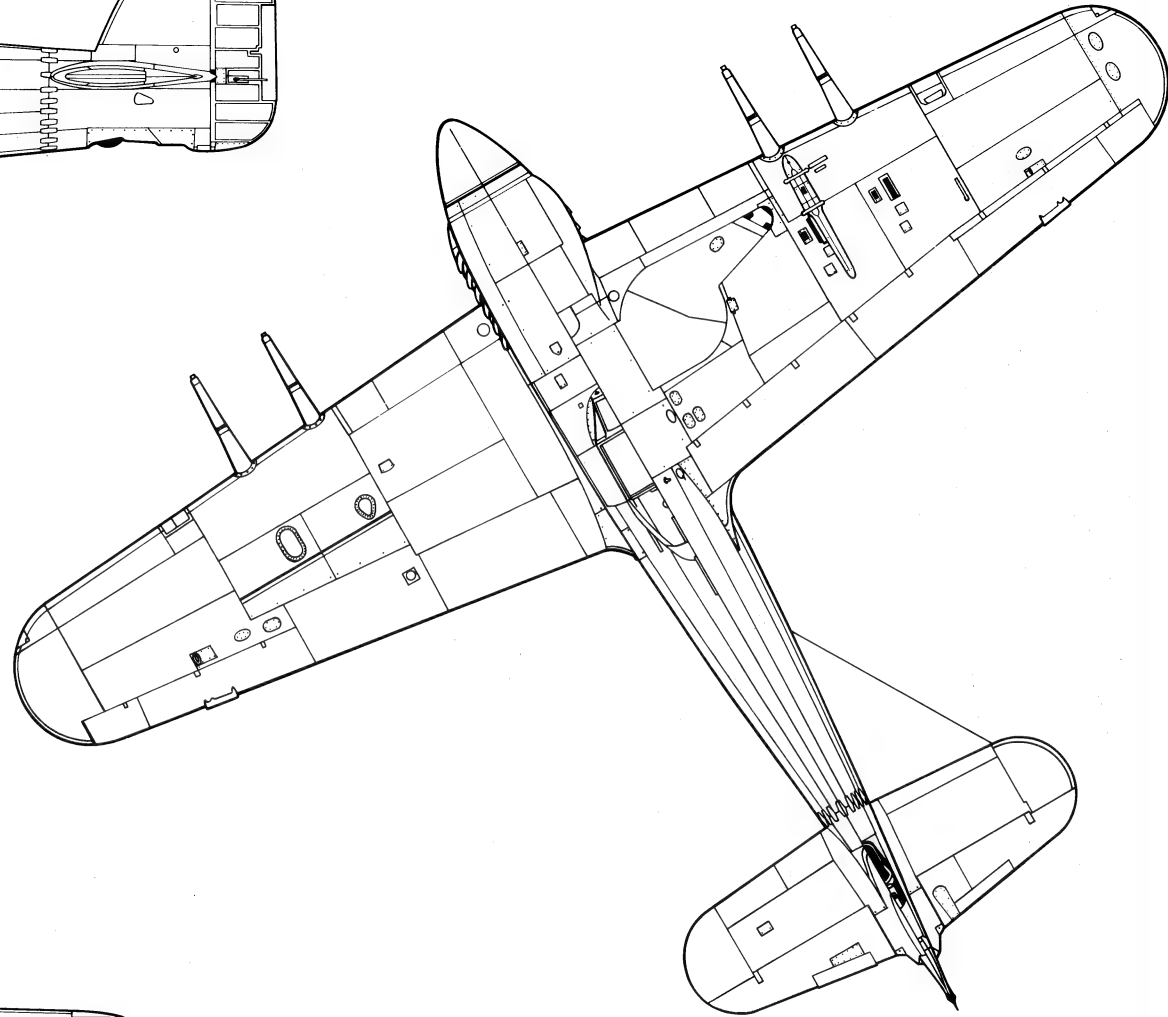
Hawker Typhoon Mk IB (Late)

Wingspan41 feet 7 inches
Length31 feet 11 ½ inches
Height15 feet 4 inches
Empty Weight8,840 pounds
Maximum Weight13,980 pounds
PowerplantOne Napier 2,260 hp liquid cooled, in-line engine

ArmamentFour Hispano Mk II 20MM cannons, two 500 or 1,000 pound bombs or eight 60 pound rockets.

Performance

Maximum Speed413.5 mph
Service ceiling34,000 feet
Range510 miles
CrewOne





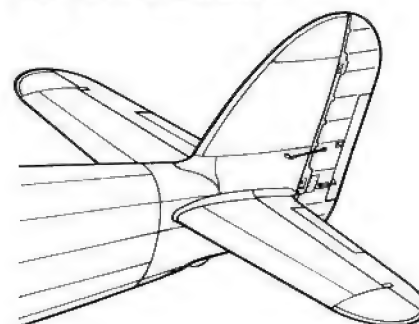
These Black and White recognition stripes were used on the Typhoon to identify it to British anti-aircraft gunners who often mistook the Typhoon for the German Fw 190.



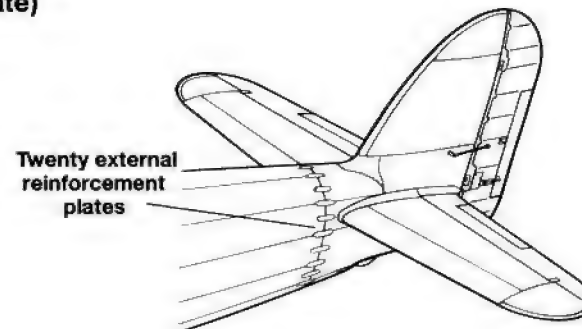
Among the experimental recognition schemes tried out on the Typhoon to make the aircraft less of a target for British anti-aircraft gunners (who often mistook the Typhoon for a German Fw 190) was painting the nose overall White.

Tail Development

Typhoon IB
(Early)



Typhoon IB
(Late)



Experimental Typhoons

Among the projects Hawker undertook to improve the Typhoon were two projects that actually led to test flights with modified aircraft and a number of other programs that remained merely design studies. These included a mock-up wing that was fitted with six 20MM cannons. There was another study that reduced the wing span to 39 feet 6 inches, while yet another study extended the wing to 44 feet 2 inches. In both cases, the projected performance figures were disappointing and both wing projects were abandoned without ever being flown.

There was considerable effort at Hawker to develop the Typhoon into a single seat night-fighter. The night-fighter project involved fitting one aircraft, a Typhoon IB (serial R7881) with an Air Intercept (AI) Mk IV radar. With the radar installed the aircraft was redesignated as the Typhoon NF IB. The radar's antennas were mounted in the wing leading edges and the electronics were installed in the space gained by deleting one of the fuel tanks. The loss in internal fuel capacity was made up by the use of 44 gallon underwing drop tanks.

Trials with the radar-equipped aircraft were undertaken at Farnborough starting on 17 April 1943 and by the Fighter Interception Unit at Ford some two months later, on 15 June. At least two operational patrols were made over London during 1943 but, while the radar functioned satisfactorily, the night-fighter Typhoon was found to be unsatisfactory and did not enter production. The decision to abandon the project was also influenced by the fact that AI radars had been successfully installed and tested in multi-seat aircraft

This Typhoon IB (R7881) was used as the prototype for the proposed Typhoon NF IB night-fighter. The aircraft carried the air intercept radar antennas in the wing leading edges. In the event, the project was cancelled in favor of larger multi-engine night-fighters.



with twin engine reliability, such as the Beaufighter and Mosquito. These aircraft had the additional advantage of a second crewman who functioned as the dedicated radar operator.

A series of experimental flights were made by three Typhoons shipped to the Middle East during April of 1943. Typhoons R8891, DN323 and EJ906 were the aircraft involved, and all were modified with a tropical air filter positioned just to the rear of the radiator. This air filter was to be used during ground engine runs, taxi, takeoffs and landings, when dust conditions were at their worst. Once airborne, the tropical filter was disengaged and the standard air intake was used.

Temporarily attached to No 451 Squadron, Royal Australian Air Force at El Daba, the tropicalized Typhoons were flown by nineteen pilots, all of whom were enthusiastic about the aircraft's performance. In the event, the needs of the Typhoon force in Europe prevented any Typhoons from being used operationally in the Middle East (Hawker later conducted cooling tests in the Middle East with another Typhoon serial MN290).

These two Typhoon IBs (along with a third aircraft) were sent to North Africa for a brief series of flight tests under desert conditions. The aircraft carried a desert camouflage scheme and Black propeller spinners. In the event, these were the only Typhoons to see service in North Africa.



The First Typhoon Wing

During January of 1942, No 56 Squadron was joined by a second Typhoon squadron, No 266 (Rhodesian), followed in April by a third unit, No 609 (West Riding of Yorkshire) Squadron. With all three squadrons based at Duxford, Fighter Command formed them into the first Typhoon Wing under the command of Wing Commander Denys Gillam. He was one of a growing number of pilots who appreciated the qualities of the Typhoon, especially the aircraft's stability in a dive that made it a good gun platform. The deep section, forty-one foot wing span enabled the Typhoon to stay on target in a shallow dive without the vibration experienced with other fighters.

Diving the Typhoon from altitude, however, brought out another problem. As with other Second World War fighters that were able to go over 400 mph, the Typhoon built up speed very rapidly in a dive. As speed increased, the compressed airflow over the control surfaces broken by fairings, bumps or surface unevenness, formed turbulence as the aircraft approached the speed of sound. Compressibility, as it became known, was barely understood at the time and a number of fatal crashes were caused by the problem. As flight testing helped increase understanding of the problem, RAF officials were able to alert pilots to the phenomenon and post dive angle/speed restrictions on the Typhoon, while the engineers worked on more practical solutions.

As Typhoon production increased, the operational squadrons found replacements easy to come by if their aircraft were damaged from operational or other causes. In fact, there were more airframes than engines since Napiers were still having trouble with the Sabre's sleeve valve failure rate and a number of new Typhoons went into storage while waiting for engines. In the meantime, squadron fitters (more of whom were allocated to Typhoon squadrons than other fighter units) at Duxford performed miracles in keeping the aircraft flyable.

The primary task of the Typhoon squadrons was to maintain standing down to dusk patrols along the English coast to catch low level raiders. These were flown at low level, under all weather conditions. A patrol was usually flown at 200 feet and often much lower, since low flying hit and run raiders were almost impossible to see even from a few hundred feet above them. These patrols often yielded nothing and squadron commanders sought permission from Fighter Command to undertake offensive sorties.

During early 1942 the concept of using the Typhoon in a low level offensive role was examined closely and a series of armament tests were undertaken at A & AEE Boscombe Down. These tests were aimed at mating the aircraft with bombs, drop tanks, mines and smoke canisters.

The Typhoon's expanding missions included night operations against targets of opportunity. Train busting was a particularly effective mission and No 609 Squadron became adept at this type of mission. The squadron commander, Roland Beaumont, was highly vocal in his support of the Typhoon in the low level role and helped kill the idea of halting Typhoon production. Beaumont was not alone in his enthusiasm for the "Tiffie" (as the aircraft was called by its pilots), but he had also had experience in test flying the Typhoon and could back up his arguments with considerably more knowledge than those who called for the aircraft to be cancelled.

Some two years before the D-Day invasion, the Allies carried out a dress rehearsal at Dieppe, France. The Duxford Typhoon Wing flew cross-Channel support and fighter sweeps, achieving some success. A No 266 Squadron pilot shot down a Do 217 on 19 August, but was promptly shot down by a Spitfire.

The increasing use of the Typhoon in the ground attack role led to the breakup of the Duxford Wing on 18 September 1942. By that time, there was a fourth Typhoon unit, No



This Typhoon IB (R7698) was the personal mount of Wing Commander Denys Gillam from June to December of 1942. Gillam flew this aircraft when he led No 266 (Rhodesian) Squadron on its first operational sortie on 20 June 1942.

486 Squadron, the second New Zealand fighter squadron formed in the UK. No 486 worked up with the Typhoon while conducting standing patrols, keeping two aircraft airborne during daylight hours, with two others on alert. The patrols were flown over established areas of the south coast under radar control from the Isle of Wight station. Pilots began flying their patrols at 500 feet (designed to give them a chance to catch the sneak raiders in a long, shallow dive) but, because of the visibility problem mentioned earlier, the ceiling was gradually lowered until it was not uncommon for the Typhoons to leave a propeller wake as they flew a few feet above the wave tops.

This type of flying taught pilots to be alert as to where they were at any given time and built up valuable experience in instrument flying, since the weather was often less than clear. This "feel" for their "beat" was important because the Typhoon pilots had to watch for enemy aircraft and also avoid any friendlies in the area, in case they were mistaken for Focke-Wulfs. On top of this was the hazard that they might be mistaken for an enemy aircraft by trigger-happy British flak gunners.

During July of 1942, No 257 Squadron changed from the Hurricane to the Typhoon and was assigned to cover the West Country area from Exeter and Warmwell airfields as part of 12 Group. The existing 11 Group squadrons divided their time between standing patrols and offensive operations. After extensive trials, the Typhoon was finally cleared, to carry two 500 pound bombs under the wings and by September of 1942, Nos 181 and 182 Squadrons became the first to equip with what were sometimes known as "Bomb-phoons." No 182 Squadron, also equipped with fighter-bomber Typhoons, became operational in November of 1942.

Before the end of 1942, Typhoons were delivered to another four squadrons — Nos 195, 197, 198 and 245. This gave Fighter Command a total of thirteen squadrons, either equipped or in the process of converting to the Typhoon. By April of 1943, six additional squadrons had come on line: Nos 3, 247, 193, 174 and 175 Squadrons.



Two sections of early production Typhoon IBs of No 56 Squadron patrol over the English countryside. No 56 Squadron was the first squadron to receive the Typhoon IB and carried the squadron identification code US.



A Typhoon IB of No 609 Squadron (DN406/PR-F) parked in its dispersal spot at Tangmere during May of 1943. The aircraft has the later faired cannon barrels and carried a score of eighteen locomotive silhouettes on the starboard side under the cockpit.

No 486 Squadron, Royal New Zealand Air Force was based at Tangmere during 1943 and was among the first Commonwealth units to receive the Typhoon IB. This Typhoon IB (JP532) was often flown as a fighter-bomber using removable underwing bomb racks.



This forty-four gallon Hurricane type under wing drop tank was the first type of drop tank cleared to be carried on the Typhoon IB. The fully faired cannon barrels have two sections, with the front section being easily removed for servicing.



The Offensive

Buildup for D-Day

Typhoon strength continued to build throughout 1943 with Typhoon squadrons regularly attacking enemy supply lines in France. Besides flying interdiction sorties, Typhoons also flew escort for Whirlwinds and Beaufighters on anti-shipping strikes. Night missions across the Channel also increased, since the Germans began to move more of their rail traffic at night. No 609 Squadron destroyed over 100 locomotives by April of 1943, many of these at night.

While the Typhoon's four cannons could usually destroy lightly protected targets, harder structures required bombs and during late 1943 the Typhoon was cleared to carry two 500 pound bombs on underwing racks. Missions with these bombs had shown little adverse effect on the aircraft's performance, so trials aimed at doubling the bomb load were begun during April of 1943. It was a year later, however, before Typhoons used 1,000 pound bombs in action.

Part of the problem in lifting the heavier weight (and releasing the bombs cleanly) was the torque of the Sabre engine. Engineers had known for some time that a four blade propeller would help solve the problem. A four blade propeller would absorb surplus power on takeoff when the aircraft had a tendency to swing hard to starboard. Flight trials with a four blade deHavilland propeller had been flown during October of 1941 by Hawker and by No 56 Squadron in November; however, the four blade propeller was not cleared for operational use (in conjunction with a larger fin and rudder) until 1944.

During July of 1943, RAF Fighter Command consolidated Typhoon squadrons into wings. The first new Typhoon wing was No 16 Wing which comprised six squadrons under 11 Group. Typhoon strength now totaled twelve squadrons in 11 Group, four squadrons in No 10 Group and two squadrons in No 12 Group.

Besides the usual bomber escorts and low level fighter sweeps, the squadrons also flew cover for Air Sea Rescue (ASR) craft and shipping reconnaissance missions, sometimes known as Lagoons. Typhoons flew missions under all weather conditions, since it was found that poor visibility and low clouds could actually aid in low level penetration of enemy defenses. A low cloud base could give Typhoon pilots a convenient place to hide if things got a little too hot.

Going in on the deck also helped avoid interception by enemy fighters, although losses to flak were high. If enemy gunners hit the engine or radiator, Typhoon pilots had only seconds to belly in their aircraft on the first convenient flat spot. The Typhoon's speed and strength, however, enabled many to return to base when a lighter aircraft would have been destroyed.

Some 380 Typhoons were lost to all causes during 1943. While this total seems high, the Germans lost a far greater amount of personnel and equipment. Typhoons were credited with the destruction of 103 enemy aircraft in air-to-air combat during the year, fifty-two of these being Fw 190s.

During August of 1943, supplies of forty-five gallon drop tanks reached the point where Typhoon squadrons were able to routinely reach targets at ranges out to some 980 miles. With tanks, No 609 Squadron Typhoons were able to penetrate the borders of the Reich. By mid-Summer all but two Typhoon squadrons had aircraft which were stressed to carry bombs and by the Fall of 1943, Typhoons started using a new weapon — the rocket projectile.

Flight tests with a load of eight rockets, along with their launch rails, had revealed few problems; in fact, stability of the aircraft actually improved. The only negative aspect was the loss of acceleration when pulling out of a dive (which was allowed for). The rocket armed Typhoon quickly became one of the RAF's most potent weapons.

The rocket installation consisted of four rails carried under each wing. Initially the Typhoons were fitted with Mk I steel rocket rails which weighed some 408 pounds per set. The rockets themselves weighed 240 pounds for a total of 648 pounds per wing. Aluminum Mk II rocket rails, introduced during December of 1944, reduced the overall weight by 240 pounds (increasing a rocket armed Typhoon's speed by 15 mph). The Mk I and Mk II differed in design. The Mk I rack consisted of a tapered rack suspended from two posts. Immediately under the rack were two round section launch rails which suspended the rocket by spring clips (which sheared off when the rockets were fired). The Mk II was a cleaner design, being a straight rack with one round section rail.

While the standard load was normally eight rockets, armament specialists had developed a "saddle" mounting enabling a second row of rockets to be slung below the first. The use of the saddle enabled varying loads to be carried using either single or paired racks.

Other underwing ordnance carried by Typhoons included a 520 pound anti-personnel cluster bomb. This weapon contained twenty-six segments, each weighing 20 pounds and was designed to burst on impact, scattering shrapnel over a wide area. The bomb had nose and tail fairings and could be carried on standard bomb racks.

Rocket attacks were initiated on 25 October 1943 by No 181 Squadron (16 Wing). Supported by the other five Typhoon units in the wing, No 181 attacked the Caen power sta-

A pair of Typhoon IBs take off with a load of underwing bombs on another interdiction sortie. During the period before D-Day, Typhoons were used to make a number of fighter-bomber raids against German coastal radar sites.



tion using two flights of three aircraft. Running into flak enroute the target, only half the force carried out the attack, registering hits on the target.

On 13 November, the 2nd Tactical Air Force was formed as a component of the Allied Expeditionary Air Force. The 2nd TAF was to provide much of the air support for the invasion of Europe, scheduled for the following year. By the end of January 1944, Nos 137, 164 and 438 (RCAF) Squadrons had received Typhoons, as had two additional Canadian squadrons, Nos 439 and 440. New Typhoon wings were formed while others were disbanded, as the RAF reorganized to create a cohesive ground attack force for Operation OVERLORD.

During December of 1943, the first V-1 flying bomb launch sites were located during reconnaissance of the Pas-de-Calais area in France. Typhoon squadrons joined the Allied effort to eliminate these sites, although after February of 1944 they scaled back their involvement to conserve the ground attack force for operations over the invasion beachheads. With the invasion coming, losses, particularly of experienced flight commanders, had to be kept as low as possible.

During the Spring of 1944, the Typhoon force was reduced by four squadrons, leaving twenty units on strength to handle invasion support. Eighteen of these were in the 2nd TAF with two, Nos 137 and 263, remaining in Fighter Command (now known as Air Defense of Great Britain - ADGB). These units were engaged mainly on anti-shipping strikes.

Special operations were flown against the German coastal radar chain. Heavily defended, the sites often required repeat attacks, with high losses. To mask the exact areas of the Allied landings, British fighter-bombers had to range far afield, hitting targets well outside the intended assault area. The anti-radar campaign was highly successful and during the invasion, the German defenders had to cope with large gaps in their radar coverage.

This Typhoon IB has been modified with a whip antenna replacing the solid radio antenna mast behind the cockpit. The aircraft was used for flight tests of a four blade propeller. The propeller and its spinner are in Black.

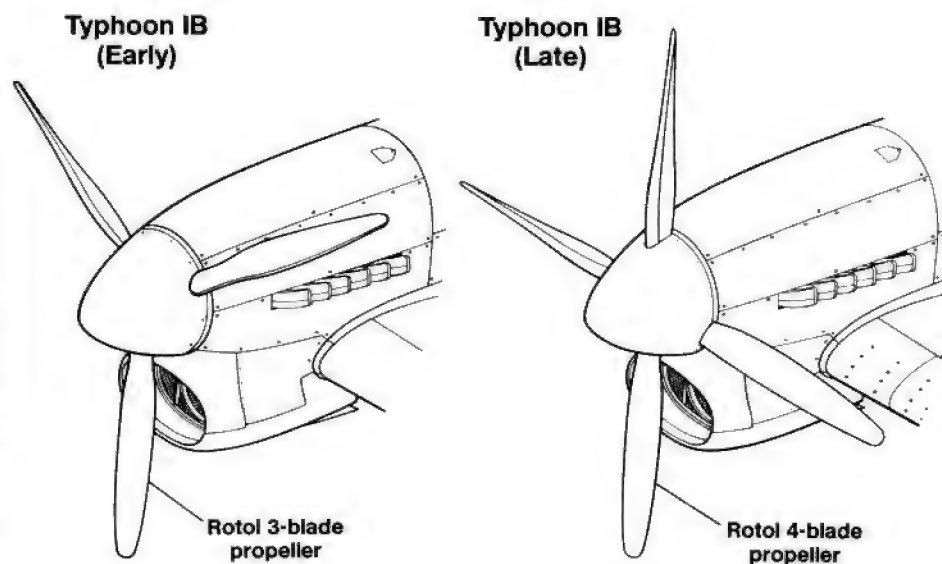


Operational tests of Typhoons fitted with an Abdullah receiver designed to home in on German radars were conducted during this period. This early electronic counter measures equipment had one drawback — it had to be pre-tuned to a known frequency. To counter the system, all the Germans had to do was switch off the radar. They soon learned to recognize an aircraft “riding the beam” — which was necessary to keep the signal audible. In the event, British intelligence had already plotted some 600 individual radar sites located between Denmark and southern France and photographic reconnaissance was adequate to spot any new sites, so the Typhoon fitted with the Abdullah receiver was abandoned.

D-Day

Among the first Allied aircraft over Normandy on 6 June 1944 were Typhoons of the 2nd TAF. Nine of the eighteen squadrons in TAF were put on Air Alert and at any one time three squadrons were over the British and Canadian armies. Few Allied tanks could match German armor and a Tiger could pin down (or destroy) far superior numbers of Shermans. This was especially true if the Germans were dug in. In Normandy, the balance was often tipped in the Allies' favor by rocket-firing Typhoons.

Propeller



Priority was given to basing Typhoons on the Continent as soon as possible. The first airfields were under construction on D Plus One and Typhoon squadrons quickly moved in. The move was premature and heavy German shellfire forced the rapid evacuation of the entire force back to England. The temporary relocation back to England enabled an air filter to be installed on the carburetor air intake to prevent the fine, abrasive Normandy dust from causing accelerated wear on the Sabre engines. By the end of June 1944, Typhoons had moved back to French bases.

As the Allies pushed into France, Typhoon squadrons ranged ahead of the army, with Spitfires and Mustangs flying top cover. The ground attack units kept a steady pressure on the Germans, hampering their efforts to reinforce the beachhead. Typhoons destroyed vehicles, tanks, ammunition dumps, troop concentrations and rail transportation.

On 17 July 1944, a new system was introduced to give the ground forces even better close air support. The Visual Control Post, or "cab rank" system, directed standing patrols of Typhoons to targets located close to friendly troops. Usually located in an armored car with the advance troops, the VCP was manned by a Forward Air Controller who was in radio contact with the Typhoon patrol. Coordination between pilots and controllers was made by reference to gridded maps and by the use of colored smoke markers laid down by the ground forces. The system worked extremely well and enabled Typhoon attacks to be made wherever they were most urgently needed.

During August of 1944, the German 7th Army was trapped in the narrow country lanes surrounding Falaise, France. In the battle for the Falaise pocket (14-25 August), Typhoon squadrons inflicted heavy damage on the Germans, while taking high casualties themselves. When German tanks and armored vehicles attempted to break out of the pocket, they were attacked by Typhoons. Few of the German troops made it across the Seine before Typhoons brought down the last of the Seine bridges. Shortly after this battle, German resistance in France was shattered.

When the Allies pushed into Belgium, Typhoon squadrons moved to Lille/Vendeville Airfield on 11 September. During late September the RAF took over the first Dutch bases to be cleared of the enemy, enabling Typhoons to operate over Germany itself. As the momentum of the advance slowed, Typhoons were used to mop up bypassed areas still held by the Germans. The slower pace of operations also allowed a number of squadrons to rotate to England to attend Armament Practice Camp.

On 17 December 1944, the Germans opened the Battle of the Bulge in the Ardennes under the cover of bad weather. This weather lasted until Christmas Eve, when the skies finally cleared and Allied fighter bombers attacked the Germans columns with rockets, bombs and guns. The German advance was slowed, then halted. During the Battle of the Bulge, German fighters occasionally succeeded in getting through the Allied fighter screen and the low flying Typhoon squadrons suffered casualties. Besides fighters and flak, individual aircraft were also brought down by debris from the targets they attacked, as happened to the commander of No 247 Squadron on 23 December 1944.

On 1 January 1945, the Luftwaffe launched Operation *Bodenplatte* against Allied airfields in Holland and Belgium. The attack wrecked havoc at Eindhoven, home of Nos 124 and 143 Wings, each with four Typhoon squadrons. When the attack was over, nineteen Typhoons had been destroyed and fourteen were damaged. Other Typhoons were destroyed by low flying Bf 109s and Fw 190s at Asche. The losses were not all one sided, however, and four Typhoon pilots of No 439 Squadron attacked fifteen Fw 190s and promptly shot down four.

In February, Typhoons supported Operation VERITABLE, the British and Canadian push to the Rhine. Numerous tanks, armored vehicles and wheeled vehicles were destroyed before the Rhine was finally crossed during March. With the war winding down, the Typhoon wings were reduced in size since trained replacement pilots were in short supply. Since a call for volunteers to transfer from Spitfire squadrons was widely ignored, the reduction to a three squadron wing became the only option.



Typhoon IBs of No 181 Squadron, the first squadron to use the Typhoon in the fighter-bomber role, lined up on the grass field at Appledram, West Sussex on 28 June 1943. The squadron was formed at Duxford and moved several times before settling at Appledram.

This Typhoon IB (EK497) undergoes testing armed with eight 60 pound rocket projectiles mounted on underwing racks during 1943. These tests were successful and the rockets became part of the Typhoon's standard armament.



As operations continued into the Spring of 1945, 146 Wing at Deurne/Antwerp resurrected the idea of a reconnaissance Typhoon to obtain immediate photo coverage of ground attacks, despite the fact that earlier tests with a reconnaissance Typhoon had been less than successful because of airframe vibration. Three surplus aircraft were modified with a forward facing F-24 camera being positioned in the inner cannon bay and synchronized with the gunsight. This enabled photos to be taken of the target and still allowed the pilot to engage the target with his remaining pair of cannons.

The original camera installation in the Typhoon FR 1B consisted of one 14 inch and two 5 inch cameras mounted in the port wing in place of the inner cannon. The lenses occupied three ports, two vertical and one oblique (which was faired, so that the lens had a clear view to the side). Two squadrons, Nos 268 and 4, used the PR Typhoon, which was known by the designations Tac R Mk IB, FR Mk IB and PR Mk IB. No 268 Squadron used its aircraft until January of 1945 when they were replaced by Mustangs. No 4 Squadron received their aircraft from No 268 Squadron and the only Typhoon FR 1B lost to enemy action was flown by No 4 Squadron and was lost during November of 1944.

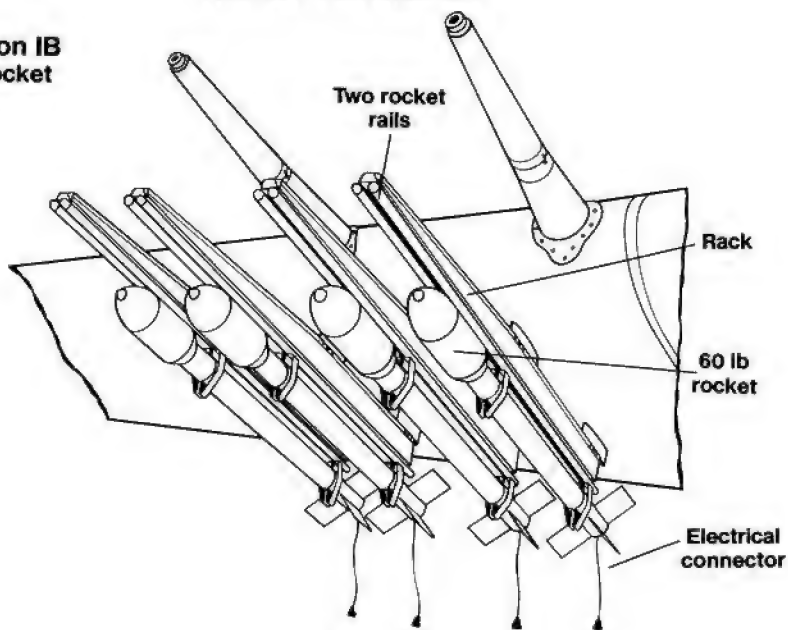
Typhoons first met German jets in combat on 14 February 1945. Typhoons of No 439 Squadron caught two Me 262s, shooting down both. A third Me 262 was destroyed on 23 April. The last enemy aircraft destroyed by Typhoons fell on 3 May 1945. This Bv 138 was attacked by twelve pilots of No 193 Squadron as it tried to take off during an attack on its base. Typhoon squadrons produced eight aces, the top scorer being Group Captain Johnny Baldwin, who scored a total of fifteen victories while flying with Nos 609, 198 and 146 Squadrons.

Before the war ended, Typhoons dropped napalm, carried out blind bombing under the direction of a Mobile Radar Control Post and assisted the French SAS by dropping food and arms containers. Numerous enemy targets were attacked, right up to the German surrender. During April, at least thirty-eight Typhoons were lost to flak and the final loss record was more than 500 aircraft since D-Day. Over 220,000 rockets were launched during the European campaign, the majority of these being fired by Typhoons.

After the war the Typhoon quickly disappeared from RAF service. A few were used as target tugs during 1945 and 1946, but the majority of the 3,317 Typhoons built were scrapped.

Rocket Installation

Typhoon IB Mk I Rocket Rails



A Typhoon IB climbs out from a forward airfield armed with eight 60 pound rockets for another ground attack sortie. This is a late production Typhoon IB with a four blade propeller.

Ground crewmen load 60 pound rockets on the wing racks of a Typhoon IB of the 2nd Tactical Air Force. Each Typhoon could carry eight rockets, making them a potent ground attack weapon against German armor.





A Typhoon IB (EK176) of No 1 Squadron at Lympne, Kent, on 6 July 1943. This aircraft was wrecked a few weeks later, on 18 August, when the pilot was forced to make a crash landing on the beach at Lydd.



This Typhoon IB (EK128) suffered Category B damage on 30 January 1944 and was repaired during July by No 511 Forward Repair Unit. The aircraft was returned to service and saw action with Nos 174 and 137 Squadrons.

This Typhoon IB (JP961) of No 1 Squadron crash landed in France on 22 December 1943. The pilot, Flight Officer Wyatt, became a POW and his aircraft was recovered by the Germans and broken up at a salvage yard in France.

This Typhoon IB of No 137 Squadron is fitted with a four blade propeller and late style under wing rocket rails. Later, it was found that these long launch rails were unnecessary on high speed fighters.





Ground crewmen prepare a Typhoon IB of No 440 Squadron for maintenance on its Sabre engine on the flight line at Eindhoven, Holland, during the Spring of 1945.



This late production Typhoon IB of No 440 Squadron has the cowling panels removed so that maintenance personnel can work on its engine at Eindhoven, Holland, during the Spring of 1945. The Sabre engine required a lot of preventive maintenance.

An RAF aircraftsman changes the starboard main landing gear wheel of a Typhoon IB. The rack stand point is between the two inner rocket racks. These racks are the early MK I type with two round launch rails below the rack.



A salvage truck prepares to lift this Typhoon IB of No 182 Squadron back onto its landing gear after its pilot was forced to belly land the aircraft at Eindhoven on 24 March 1945.





Five maintenance fitters lift the Sabre engine from a Typhoon IB at Eindhoven, Holland. The large pipe protruding above the radiator was the main connection line between the engine and the radiator.



A Typhoon IB (PD608) of No 439 Squadron undergoes maintenance at a forward airfield during early 1945. The aircraft carries late war RAF markings with the Sky fuselage band being deleted and a four color upper wing roundel being used (this roundel was introduced on 3 January 1945).

Wing Commander F. G. Grant, commander of No 143 Canadian Wing taxis in at Eindhoven during late 1944. The two ground crewmen riding on the wing directed the pilot, who could not see over the cowlings of the Typhoon. This aircraft (RB205) carried Grant's initials as its identification markings.





Burned out and damaged Typhoons on the field at Eindhoven, Holland, on 1 January 1945. These Typhoons of No 439 Squadron were among the nineteen lost when the Luftwaffe attacked the field. No 439 Squadron had only one Typhoon destroyed and one damaged during the raid.

Rocket armed Typhoon IBs of a Canadian squadron taxi out for another ground attack sortie against the retreating Germans. Typhoons were widely used to attack German transport and anything moving on the roads was a worthy target.



Ground crewmen assist the pilot of this Typhoon IB prepare for another sortie. One man has started the engine, while another stands by with a fire extinguisher, while the third assists the pilot with his parachute.



A number of Typhoons were modified for the reconnaissance role under the designation Typhoon PR Mk IB. This PR Mk IB (EK427) of No 4 Squadron during March of 1945 has a camera replacing the starboard inboard cannon.



The starboard inboard cannon fairing of this Typhoon PR IB (EK427) reveals the lens of a five inch forward facing oblique camera. This camera was used to record the damage done to targets during strikes by rocket and bomb armed Typhoons.

The cockpit of the Typhoon had the basic six flight instruments directly in front of the pilot, with the engine instruments to the right. As was common on British fighters, the control stick was topped with a ring grip which had the gun and radio buttons on the left side of the wheel.



Ground crewmen load 1,000 pound bombs on the underwing bomb racks of this Typhoon IB of No 440 Squadron, Royal Canadian Air Force. Flying from forward airstrips, the Typhoons could be over the target in a matter of minutes.



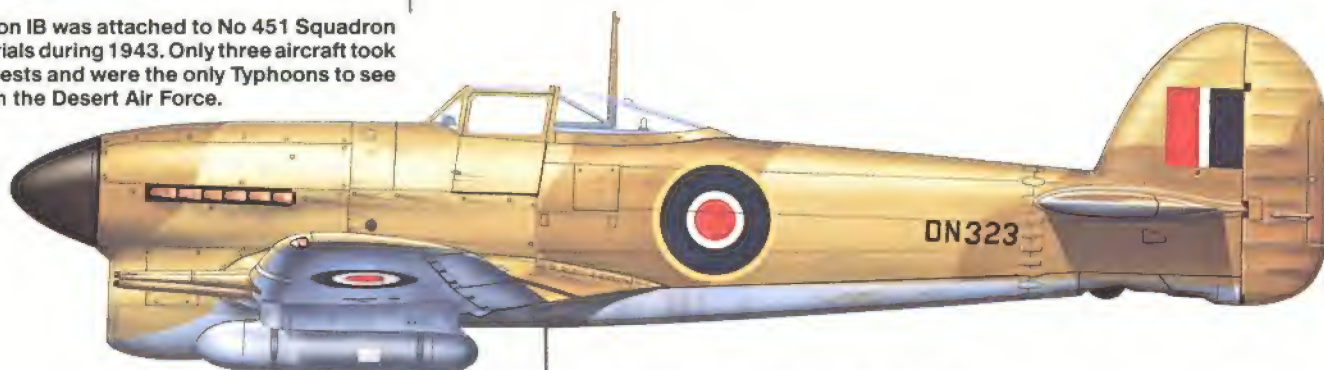
This Typhoon IB of No 183 Squadron carries exercise markings on the nose in White.



Wing Commander R.T.P. Davidson flew this Typhoon IB with No 143 Wing during May of 1944.



This Typhoon IB was attached to No 451 Squadron for desert trials during 1943. Only three aircraft took part in the tests and were the only Typhoons to see service with the Desert Air Force.



This Typhoon IB of No 245 Squadron carries Black and White D-Day invasion stripes on the fuselage. The aircraft was flown by Squadron Leader Jack Collins during late June of 1944.



Typhoon IB of No 245 Squadron carries Blue and White checkerboard markings on the rear fuselage and a Blue spinner during July of 1945.



A Tempest V of No 486 Squadron during January of 1944. Tempest Vs were one of the best fighters available to the RAF for the anti-Buzz Bomb missions of early 1944.



Tempest VIs of No 8 Squadron were based at Khor-maksar, Aden, on the Red Sea during 1947. These aircraft were involved in policing duties against local tribesmen.



This Tempest TT V was used as a target tug by the Armament Practice Station (APS) at Sylt, Germany, during 1953.



This Tempest II of No 5 Squadron served in India and was later transferred to the Pakistani Air Force.



A Tempest II of the Pakistani Air Force during 1950. The Tempest was replaced in PAF service by another Hawker fighter, the Fury.



Tempest

In March of 1940, Hawker initiated a number of design studies aimed at improving the Typhoon. Among these studies were ways of improving the Typhoon's high altitude performance. These involved the use of a new wing design that featured a thinner wing section and a reduced wing area. The new wing had an elliptical planform and showed a great potential for increasing performance at altitude while reducing the tendency of the original Typhoon wing to buffet at speeds around 500 mph.

In order to save development time, Sidney Camm decided to mate the new wing to a modified Typhoon airframe which retained the Sabre power plant. The airframe was modified with a twenty-two inch extension between the engine mount and the cockpit. This area was used to house a 76 gallon fuel tank. The RAF ordered two prototypes under Specification F.10/41 in November of 1941 and the project quickly became known as the Typhoon II.

In a separate design study, Camm had devised a pair of wing leading edge mounted radiators to replace the cumbersome chin radiator of the Typhoon. Similar in design to those used on the Mosquito, these radiators were estimated to reduce drag by nearly two-thirds.

Hawker's biggest problem with the new fighter was the engine. As with the Typhoon/Tornado, and as a precaution, it was felt that the prototypes should allow for the use of alternative engine installations. By the Spring of 1942, the various problems with the Sabre had not been fully eliminated and the company proceeded with its plans for alternative engine installations for the Typhoon II prototypes (which were renamed the Tempest during August). By this time the RAF had also revised the original prototype contract, now calling for a total of six aircraft.

Different mark numbers were allocated to each of the six prototype/engine combinations: the Mk I (HM599) was powered by a Sabre IV, the Mk II (LA602 and LA607) were powered by Centaurus IV radial engines, the Mk III (LA610) used a Griffon IIB, the Mk IV (LA614) used a Griffon 61 and the Mk V (HM595) had a Sabre II.

Tempest V

The Tempest Mk V prototype, powered by the Sabre II engine, was completed first and looked very similar to a Typhoon. The aircraft had the framed five section canopy, car-type doors and standard tail section of the Typhoon. The prototype (serial HM595) flew for the first time on 2 September 1942, with Phillip Lucas at the controls. Flight trials highlighted the need to restore lateral stability lost because of the extended nose and the prototype was modified with a fin fillet and increased span horizontal stabilizers. After modification, it was flight tested by both the manufacturer and A & AEEE. Test pilots who flew the prototype were very enthusiastic in their reports of the aircraft's performance and handling.

It was realized that, although the Tempest V's performance was less spectacular than that anticipated from the other prototypes with their more advanced engines, all of these other aircraft would take far longer to develop to a point where they would be ready for production. A decision was made to concentrate Hawker's efforts on the Sabre II powered aircraft in order to get the new fighter into operational service as soon as possible.

During the Fall and Winter of 1942 the prototype underwent further development work to prepare the Tempest for full scale production. Handling trials revealed the need to increase the area of the fin, modify the rudder trim tab, and install spring tab ailerons to improve aileron control. These and other changes improved the performance and handling of the prototype, which reached a speed of 466 mph at 24,500 feet during testing.

Having proved the Tempest V was ready for production, the prototype was used for other projects including use (after modification) as the prototype for the Tempest VI. Production of the Tempest V started in mid-1943 and the first production aircraft (serial



This Typhoon (HM595) was used as a prototype for the Tempest program. The aircraft has not yet been fully converted and retains the Typhoon's car door type pilot entry and early style canopy.

JN729) made its maiden flight on 21 June 1943. The third production Mk V (JN731) went to Boscombe Down for handling and performance tests, which revealed a top speed of 432 mph at 18,400 feet (411 mph at 6,600 feet) and a service ceiling of 34,800 feet. It was clear that the Tempest V was one of the most potent fighters in the RAF.

Armament of the first Tempest Vs was four 20MM Hispano Mk II cannons. These were identical to those fitted in the Typhoon and required fairings over the protruding gun barrels. During early 1943, the Mk V Hispano cannon, some twelve inches shorter and twenty-five pounds lighter than the Mk II gun, was ready for service. Installation of these guns in the Tempest allowed the guns to be fully enclosed within the wings. Tempests armed with the Mk V guns were designated as Tempest Mk V Series 2. The second production Tempest V (JN730) test flew another item of equipment that became standard on the Mk V, the Hawker designed 45 gallon teardrop external fuel tank. These streamlined tanks cut drag and boosted the Tempest's range significantly.

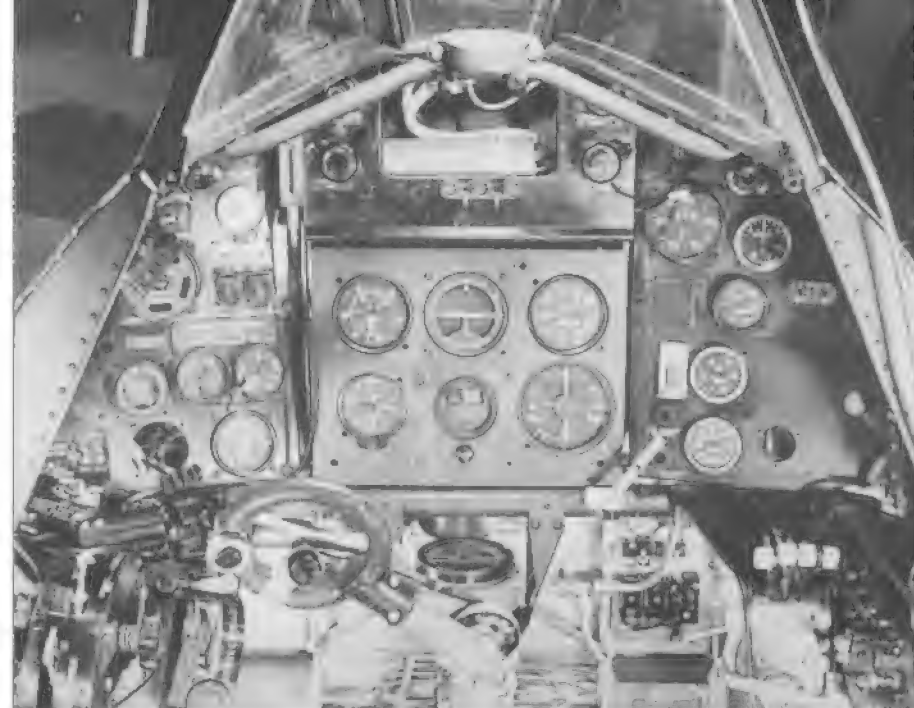
As part of the Tempest program HM595 was fitted with a fin fillet in front of the vertical stabilizer. The white line on the fuselage was a painted datum line used for photographic reference during filming of the test flights.





The second production Tempest V (JN730) was used to test fly the Hawker designed forty-five gallon teardrop shaped underwing fuel tanks. The tanks were approved for use and became a standard item of equipment for Tempest squadrons.

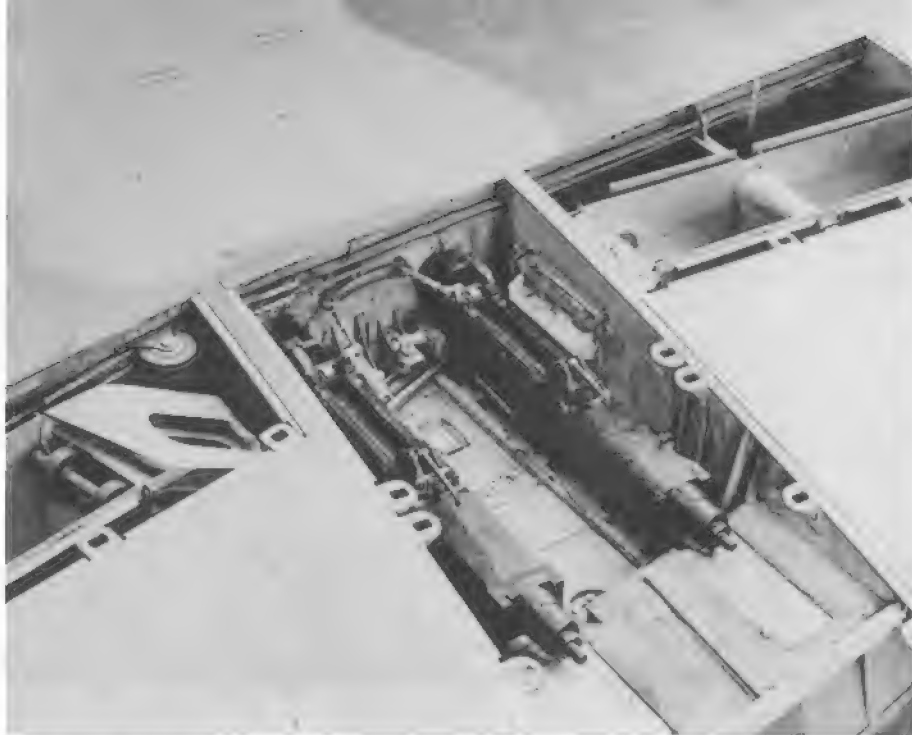
The underwing bomb rack on the Tempest V was covered with a streamlined fairing. The bomb mounted on this Tempest V is a 1,000 pound general purpose bomb. The two wing mounted 20mm Mk V cannon ports are flush with the wing leading edge and covered with tape.



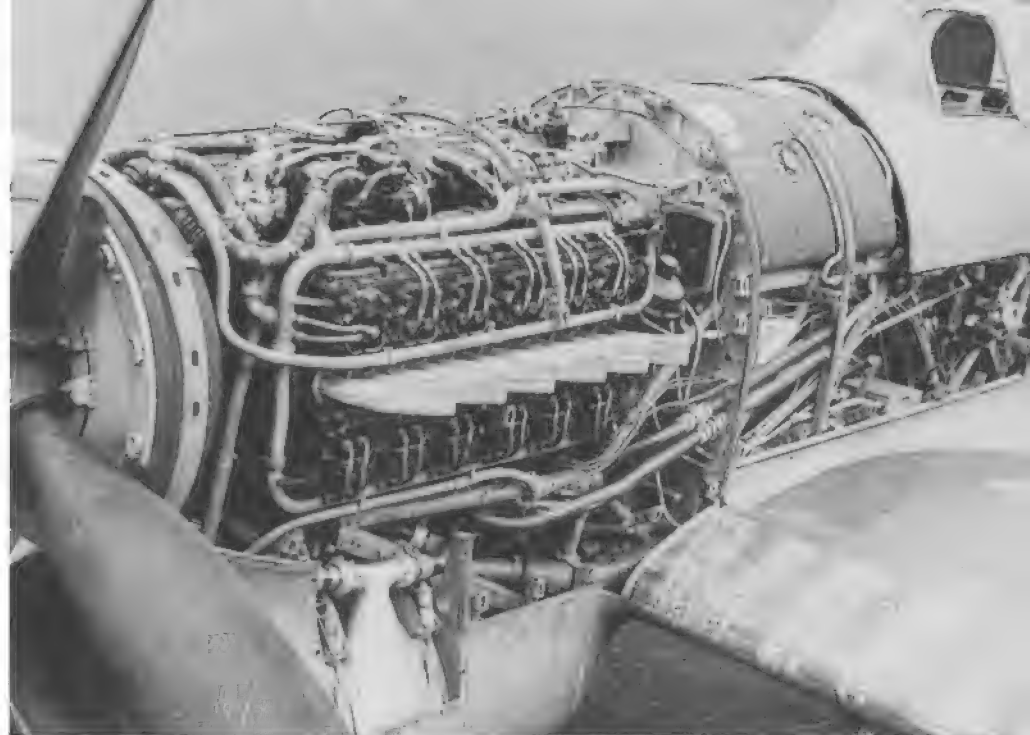
The cockpit layout for the Tempest was very similar to that of the Typhoon. The Tempest, however, replaced the reflector gunsight glass with a sight that projected the image of the sight ring directly onto the windscreen.

HM595 was later used to flight test various systems for both the Tempest V and VI. During this test flight it is fitted with equipment intended for use on the Tempest Mk VI, the final mark of Sabre powered Tempests.





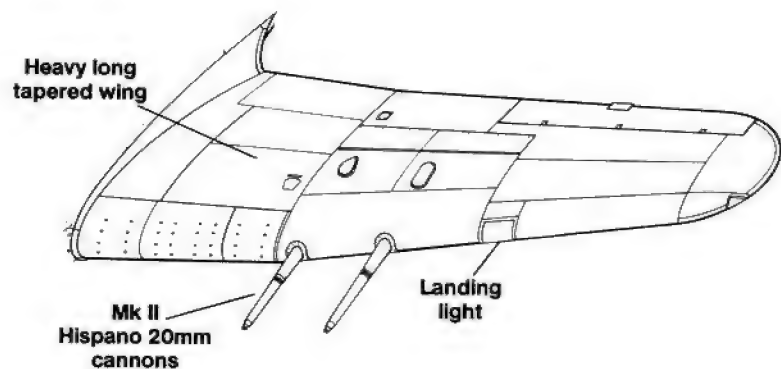
The belt fed 20mm Mk V Hispano cannons had ammunition boxes on either side of the guns. The gun bay and ammunition bays each had their own access doors which formed a distinctive T shape when seen from above.



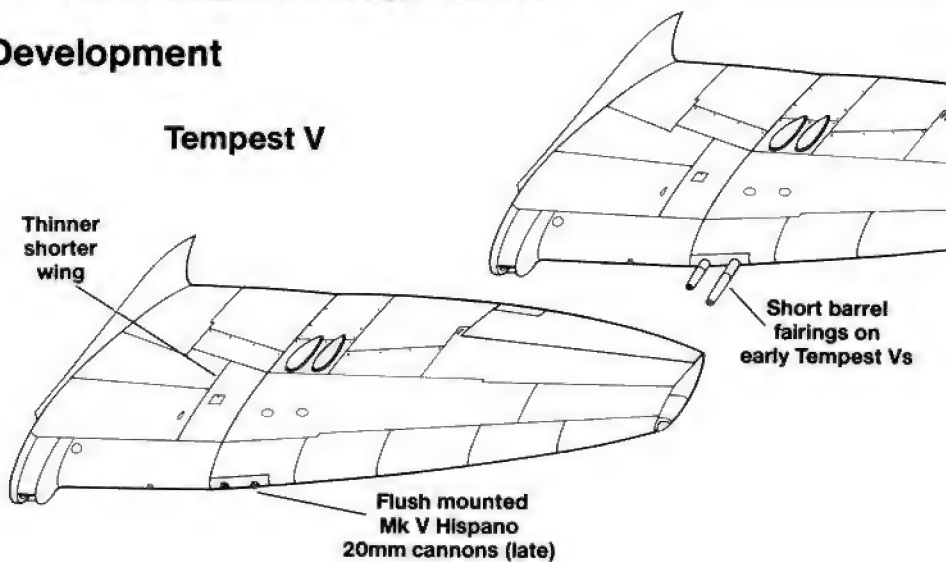
This Tempest V has the cowling removed in preparation for an overhaul of its twenty-four cylinder Sabre engine. The cylinder banks are above and below the exhaust stacks. Immediately behind the engine is the fuselage oil feed tank.

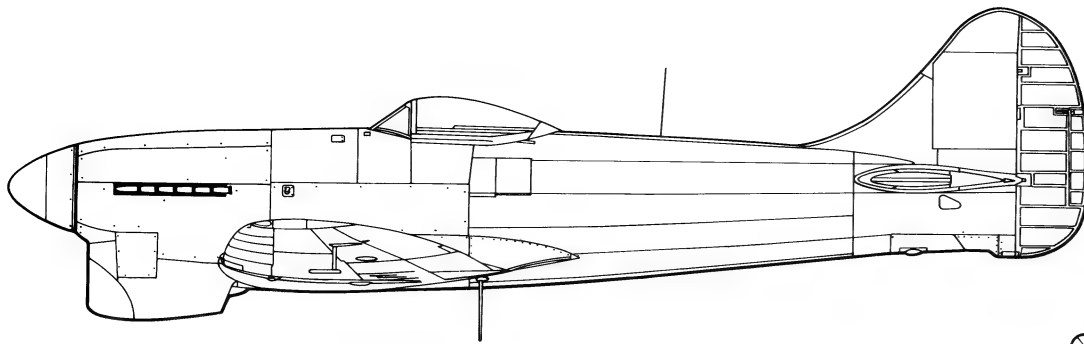
Wing Development

Typhoon IB



Tempest V





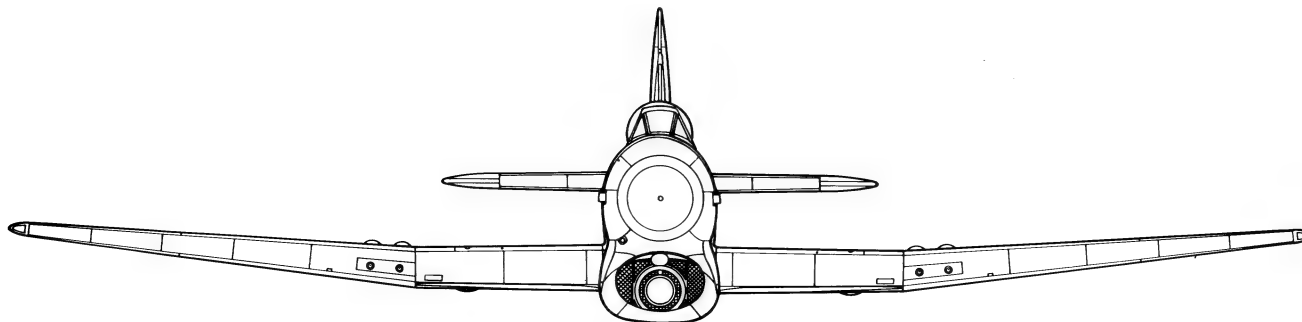
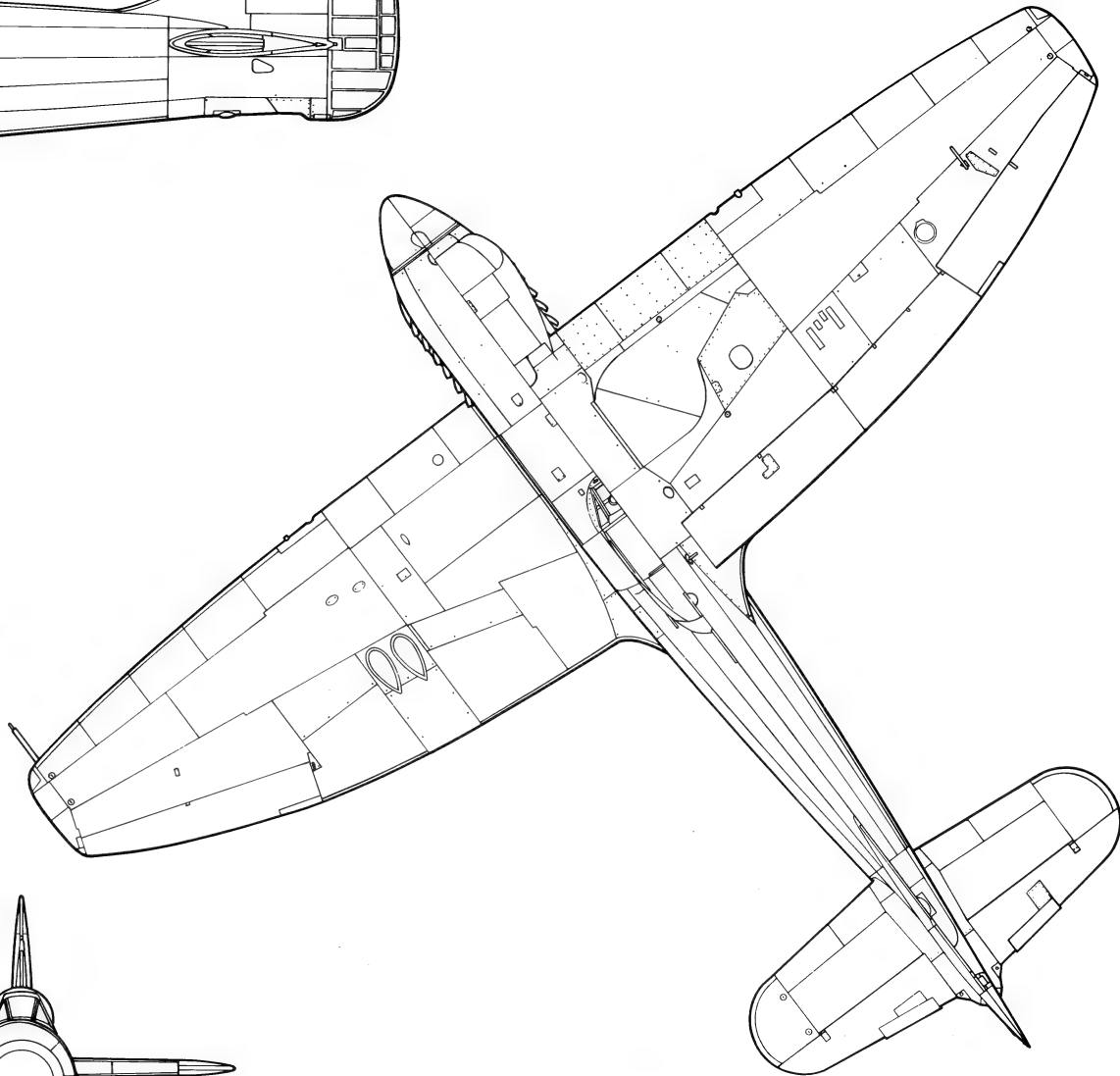
Specifications

Hawker Tempest Mk V

Wingspan41 feet
Length33 feet 8 inches
Height16 feet 1 inch
Empty Weight9,250 pounds
Maximum Weight13,640 pounds
PowerplantOne 2,180 hp Sabre II liquid cooled, in-line engine.

ArmamentFour Hispano Mk V 20MM cannons. Two 1,000 pound bombs or eight 60 pound rockets.

Performance
Maximum Speed466 mph
Service ceiling34,800 feet
Range740 miles
CrewOne





Tempests during final assembly at Langley reveal that the aircraft were painted with camouflage, national insignia, and serial numbers before the engines were mated to the fuselage. The aircraft in the foreground (SN135) served with No 274 Squadron, then with two others before being retired during 1950.



(Above) An early production Tempest V shows off its distinctive wing shape while on a test flight over England during March of 1945.



(Left) Like the earlier Typhoon, the Tempest V also carried underwing recognition stripes. This Tempest has the early Mk II cannons with barrels that extended beyond the wing leading edge, covered by short fairings.

Into Service

Having extensively flown early production Tempest Vs, the Air Fighting Development Unit recommended that the first RAF squadrons to be formed with the Tempest should be former Typhoon units. It was felt that since the two aircraft were similar in handling characteristics, re-equipping former Typhoon units would speed up the service introduction of the Tempest. During January of 1944, No 486 Squadron received its first aircraft at Tangmere, later passing these aircraft to No 3 Squadron. As more Tempests were delivered, both units became fully equipped and were declared operational during late April of 1944.

The first operational sorties (ASR patrols) were flown by No 3 Squadron on 23 April. A short time later both squadrons moved to Newchurch, Kent, where they were joined by No 56 Squadron (flying Spitfire IXs). Although deliveries of new Tempests were slow and No 56 Squadron was yet to re-equip, the three squadrons were designated as the first Tempest Wing and placed under the command of Wing Commander Roland Beamont. In the event, No 56 did not receive their Tempests before D-Day, but the squadron did fly missions over the beachheads with their Spitfire IXs.

During the D-Day landings, Tempests were kept in reserve as a precaution against Luftwaffe attacks against the landings. When this threat failed to materialize, Wing Commander Beamont led nine No 3 Squadron Tempests over the beaches on 8 June. During the patrol the squadron engaged five Bf 109s near Ronen, shooting down three of the German fighters without loss. It was an auspicious combat debut for the new fighter and the first of an impressive total of air-to-air kills. Initially, however, kills racked up by Tempests were not to be against conventional aircraft, but rather the "malignant robots" — the V-1 flying bombs.

Air Defense of Great Britain (ADGB) had the vital task of intercepting the deadly "Divers" (as the V-1s were known), preventing them from penetrating far inland and keeping London safe from another Blitz. Throughout the V-1 attacks, RAF fighter squadrons achieved a remarkable degree of success. On 16 June 1944, the Newchurch Tempest Wing began anti V-1 patrols and shot down thirteen in one day. Tempest patrols were flown daily and claims for bombs destroyed were filed every evening, more or less as a matter of course.

Tempest pilots developed techniques for dealing with the pilotless aircraft, "writing the book" on this unique form of air combat. It was found that firing on the V-1 from a range of 300 yards gave positive results and allowed the attacking fighter to get clear before the bomb exploded. The V-1s usually came in at altitudes between 1,500 to 2,000 feet and at speeds around 400 mph. Tempests had a better speed margin than other fighters at that altitude and their steadiness as a gun platform was a useful advantage.

When the V-1 offensive continued into the hours of darkness, intercepting fighter pilots now faced an even greater challenge. Their aiming point was a point of bright light — the V-1's pulse jet exhaust. Beamont developed tactics to overcome this problem. He had the Tempests fly below the bomb, then climb until they felt the V-1's slipstream. He then advised his pilots to center the exhaust flame in their gunsight and press the trigger. This method was usually enough to turn the small exhaust light into a far brighter and bigger light.

The V-1 offensive lasted until the end of August. By then, Tempest Vs had also seen action in the hands of the Fighter Interception Unit, No 56 Squadron and No 501 Squadron. By the end of the campaign Tempest pilots had claimed a total of some 800 V-1s destroyed. No less than fifty-five pilots had become Diver aces, the top scorer being Squadron



The first Tempest wing was formed at Newchurch during the Spring of 1944. No 3 Squadron was part of that wing and was held in England to spearhead the anti V-1 flying bomb defense. This Tempest V of No 3 Squadron has the cockpit canopy covered to protect it from the summer sun.

Leader J. Berry of the Fighter Interception Unit and No 501 Squadron, with a total of sixty and one-third destroyed.

Over Europe

On 25 August 1944, No 56 Squadron conducted a fighter sweep across the channel to Cassel and Tempests were once more back in action over the continent. In addition to the Newchurch Wing, Nos 274 and 80 Squadrons were engaged in attacks against targets in France. All Tempest squadrons were retained on English airfields pending the ill-fated Arnhem operation in September of 1944. Flying strafing attacks and flak suppression sorties against gun positions on islands in the Scheldt estuary, the Tempest's contribution to the operation was successful; however, Operation MARKET GARDEN failed in its objective, the early capture of bridges over the Rhine into Germany.

On 28 September the Tempest squadrons were returned to the operational control of the 2nd TAF and took up residence on the continent. Nos 3 and 56 Squadrons were the first to deploy followed by Nos 80, 274 and 486. The renewed round of combat had cost fourteen aircraft, primarily to ground fire, although the squadrons did clash with Luftwaffe fighters on more than one occasion.

Shortly after the five Tempest squadrons settled into Belgium, they were moved to Volk, Holland under No 122 Wing. Nos 80 and 274 Squadrons were, however, based at Grave temporarily, just long enough to come under attack by an Me 262, before rejoining the rest of the Wing at Volk.

"Bee" Beamont was shot down and became a POW on 12 October, with command of the Wing being passed to Wing Commander J. B. Wray. The Tempest Wing then embarked on an intensive period of air superiority missions, which was to last virtually until the end of the war.

It was the German jets that offered Tempest pilots their greatest challenge. On 13 October Tempests of No 3 Squadron destroyed one, although usually only probables could be claimed. Finally on 3 December, a No 80 Squadron Tempest flown by F/O "Judy" Garland made short work of an Me 262 of 1/KG(J) 51.

The jet fighters were seen in small numbers, while Bf 109s and Fw 190s were occasionally encountered in some strength. Hectic activity took place on 17 December as the Luftwaffe strove to give some air support to the Ardennes offensive. Tempest pilots of different squadrons clashed with both day fighters, nocturnal He 219s, and Me 262s.

The last few days of December 1944 brought plenty of action, although operations were occasionally hampered by American fighters, many of whom still had not got the message about Tempests (or Typhoons for that matter). Fortunately, few of these encounters proved to be fatal, but they remained an unnecessary hazard for the British pilots.

Fortunately the Tempest base at Volkel was not attacked during the 1 January Luftwaffe raids and airborne fighters of No 486 Squadron claimed five, with a further five shared between Nos 3, 56 and 80 Squadrons. Three Tempests were shot down by American flak on 13 January, fortunately without casualties. The next day the victory tally included two kills for FLT LT Fairbanks of No 3 Squadron, the first Tempest pilot to score five confirmed kills.

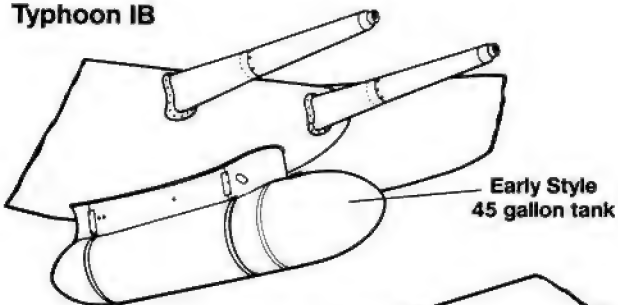
On 23 January, 2nd TAF Tempests had their best day, claiming twenty-one kills, without loss (including one Me 262). Good weather in February brought a series of interdiction missions and losses to flak. The territory held by German forces was being squeezed into a ever narrowing pocket bristling with guns. Tempest squadrons lost thirty-one aircraft during February, with nine pilots being killed. More German jets were destroyed, including examples of the Arado Ar 234, but the major part of February's effort was against German transport.

Also during the month, Nos 33 and 222 Squadrons arrived at Gilze Rijen as part of 135 Wing, while Nos 349 and 485 Squadrons returned to England. No 222 Squadron flew its first sorties on 24 February, bouncing fifteen Fw 190s and shooting down four.

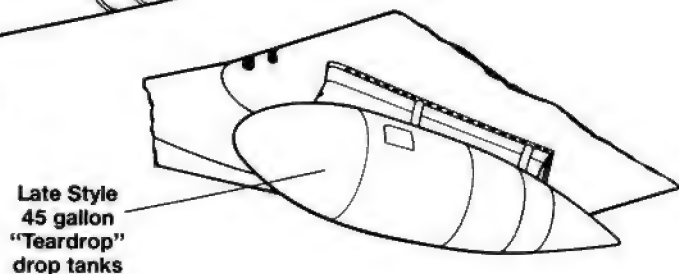
Experienced pilots continued to be lost, not only to flak but to enemy fighters as well. FLT LT Fairbanks led six Tempests into a dogfight with forty Fw 190s on 28 February. He was shot down and spent the rest of the war as a POW.

Drop Tanks

Typhoon IB



Tempest V



March brought a temporary ban on ground attacks due to the high risk of losing pilots and aircraft at this late stage in the conflict. The ban did not remain in force for long and twenty-three Tempests were lost during March on armed reconnaissance, standing patrols, fighter sweeps, strafing attacks and escort missions.

During April Hopsten Airfield was occupied by No 122 Wing, which became the first Tempest wing to operate from German soil. Few thought that the war would last much longer and on 19 April No 80 Squadron returned to England. That same day, No 222 Squadron undertook a strafing attack on Husum Airfield. During this mission, F/O Walkington chased and shot down a small jet aircraft unlike any previously seen. Subsequent analysis of combat reports and gun camera film revealed that the aircraft was an He 162, one of the few to fly operationally.

By 26 April 135 Wing was at Quackenbruck and Nos 3 and 56 Squadrons had occupied Fassberg, Germany. Air combat continued, with vast numbers of Allied fighters hunting down the last of the Luftwaffe. It was not always one sided. JG 26 was a dangerous opponent and, although the Germans were flying aircraft generally inferior to the Tempest, this unit shot down fourteen Tempests during one month.

Operational Tempests rarely carried underwing stores apart from drop tanks; however, No 33 Squadron mounted 500 pound bombs under the wings of its Tempests for some sorties during the closing weeks of the war. The final aerial victory claim by a Tempest pilot occurred on 3 May 1945 and the last combat loss was the aircraft flown by F.G. Auston, who was claimed (as a Typhoon) by LT Schmidt of JG 1 flying an He 162.

At the close of hostilities there were seven squadrons of Tempests in 2nd TAF and one in ADGB. Between them, the 2nd TAF squadrons had accounted for 240 enemy aircraft destroyed in air combat, plus thirteen probably destroyed. These figures compare closely with those for Typhoons, which claimed 246.5 confirmed and twenty-seven probables.

This Tempest V (EJ555) was assigned to No 501 Squadron during October of 1944 and carried the squadron identification code SD-Y.





On 19 October 1944, the British public was informed by the newspapers that the RAF had a potent new fighter. This Tempest Mk V (EJ608) of No 501 Squadron at Bradwell Bay, was one of the aircraft featured in the announcements and carries the recently introduced forty-five gallon streamlined drop tanks.



This Tempest V (JN751) parked on the field at Castle Camps during April of 1944, is distinctively marked with the initials of its pilot. The use of initials as code letters was a privilege granted to squadron and wing leaders: in this case, Wing Commander Roland Beamont.

Ground crewmen perform routine maintenance on a Tempest V of No 501 Squadron at Bradwell Bay during October of 1944.

Although the Tempest, unlike the Typhoon, did not use rockets operationally during the war, the Tempest Mk V was tested and cleared to carry eight rockets on Mk VIII zero length launchers.





This Tempest V is having its four 20mm cannons aligned and test fired. The guns were bore sighted and test fired into firing butts before the aircraft was issued to an operational unit.



A lineup of new production Tempests on the airfield at Langley. The lineup consists of six Tempest Vs, and a single Tempest Mk II (fourth aircraft). The aircraft in the foreground (SN117) would serve with four squadrons before being finally retired during 1950.

Squadron Leader H. C. Rigby (left) and Squadron Leader E. B. Lyons, each commanded No 222 Squadron when the unit was equipped with Tempest Vs. The squadron's Tempests carried the unit identification code ZD.



This Tempest V (SN165) of No 222 Squadron on the ramp at Quackenbruck, Germany, during 1945, has had the elevator and canopy damaged by flak. The aircraft already had a replacement rudder taken from an aircraft with a different camouflage pattern.



Tempest II

Originally, the Tempest II had been intended to be powered by the 2,250 hp Sabre Mk IVA in-line, liquid cooled engine. Sir Sidney Camm, however, felt that the radial engined Tempest Mk II would offer the ultimate in performance for the Typhoon/Tempest line and, as a result, considerable effort was made to improve the efficiency of the 2,210 hp Centaurus CE4S air cooled radial engine.

The Centaurus flew for the first time on 23 October 1941 mounted in a Tornado prototype (serial HG641). During the flight test the engine and oil temperatures remained constantly near the maximum allowable and there was a high amount of carbon monoxide gas in the cockpit. The aircraft did not fly again until after the RAF had a chance to examine a captured Fw 190A (captured on 23 June 1942). During this time, HG641 was equipped with a Centaurus IV engine, which had a large faired oil cooler air intake duct mounted below the cowl. Although engine cooling was now more efficient, the ducting caused considerable drag. The aircraft began flight tests in this configuration on 23 December 1942.

The RAF technicians, studying the captured Fw 190, found that the Germans had solved the problem of cooling a closely cowled radial engine. They used an annular oil cooler which was built into the leading edge of the cowl and cooled by an engine driven fan. The engine exhaust system avoided the use of a collector ring and gases were discharged through individual exhaust pipes mounted in front of exit louvres on each side of the fuselage.

Hawker engineers redesigned the Tempest II with the modified Centaurus IV, which incorporated much of the advanced technology reflected in the German BMW 801 used in the Fw 190. This combination resulted in what was probably the cleanest radial engined fighter of the Second World War. Built to Specification F.10/41, the Tempest II prototype, serialised LA602, made its maiden flight on 28 June 1943.

Fitted with Typhoon tail surfaces and with the carburetor and oil cooler air intakes faired into the wing root leading edges, tests with LA602 revealed that the aircraft suffered from considerable engine vibration. Tests aimed at overcoming this problem occupied much of the test flight program of the second Tempest II prototype (LA607). The answer to the vibration problem was to mount the engine on six shock absorbing rubber-packed mountings, instead of the rigid engine mounts used on LA602. Use of these mounts prevented the installation of the Centaurus XII engine (which was originally intended to power production Tempest IIs), and in the event, the Centaurus V was chosen as the production power plant. Before the Tempest II was cleared for production, aileron spring tabs were installed and modifications were made to the exhaust system.

By the time the Tempest II was cleared for production, the war in Europe was drawing to a close. Since production capacity was at a premium, the original intention was to have Gloster Aircraft build the Tempest II. Gloster, however, was fully occupied with Typhoon production and was also preparing to begin production of the Meteor jet fighter and had to defer on the contract. The Bristol Aeroplane Company's engine division had developed the Centaurus engine and it was logical for that company to also build the Tempest II airframe. Once again, previous commitments meant another delay and it was not until February of 1945 that the first Bristol built production Tempest IIs were delivered.

Hawker initiated Tempest II production in October of 1944, with the first six aircraft off the line joining the two prototypes and a Mk V conversion (JN750) for service acceptance trials.

By early 1945, it had been decided that the Tempest II would spearhead the RAF's offensive force being formed to support the invasion of Japan, known as Tiger Force.



The prototype Tempest II (LA602) was armed with the early long barreled Hispano Mk II cannons that extended beyond the wing leading edge. Originally, the aircraft had been fitted with a Typhoon style tail.

Tempest IIs would replace the ageing Hurricanes and Thunderbolts in both the fighter and fighter-bomber roles in South East Asia Command. During April of 1945 six Tempest IIs (MW801 to MW806) were dispatched to the Middle East for tropical trials. These trials were completed satisfactorily and apart from a few minor modifications recommended by service pilots, the Tempest II was ready for service in the Far East.

These plans were changed radically when Japan surrendered. By the time the war ended, production had gathered momentum and many Mk IIs were placed in storage at maintenance units. Bristol's order for 300 aircraft was reduced to fifty, thirty of these actually being assembled by Hawker from Bristol-made components. Orders for 2,133 Tempests were reduced to 452.

Just days before the war ended in August of 1945, Roland Beamont (newly repatriated from a POW camp in Germany) was given the task of forming the first Tempest II wing in England. The first unit to receive the Tempest II was No 183 Squadron which received its first aircraft during August. By the end of the month both No 183 and No 247 had completed conversion and these were destined to be the only two squadrons to fly the Tempest II in England.

RAF units were, however, to remain in Germany as part of the occupation forces. The 2nd TAF became the British Air Force of Occupation (BAFO) and the squadrons which ended the war on German bases with Tempest Vs waited to receive their new aircraft as personnel were rotated home, units were disbanded and squadrons were renumbered. The BAFO Tempest V force was only reduced by two squadrons by the time the first Tempest IIs were delivered during the Summer of 1946. No 135 Wing at Fasaberg, Germany, received the first Tempest IIs with Nos 16, 26 and 33 Squadrons re-equipping with the new fighters. The conversion program was completed by October of that year. In the event, 123 Wing at Wunsdorf (Nos 3 and 80 Squadrons) continued to use the Tempest V until 1948 when the two squadrons re-equipped with Spitfire F 24s and Vampires respectively, often using captured German tanks as targets. In addition to the exercises, numerous border security patrols were flown. During 1949, Nos 16 and 26 Squadrons finally relinquished their Tempest IIs for Vampire jet fighters, although No 33 Squadron would continue to fly the Tempest II until June of 1951.

This early production Tempest II carries the White recognition markings which were to have been used on Tempest IIs assigned to the RAF's Tiger Force for the invasion of Japan. In the event, Japan surrendered before the force deployed to the Pacific.



The Tempest II had an extremely close fitting cowling which had four opening access panels. This Tempest II has all four panels open and reveals the individual exhaust stacks which exited from openings on the fuselage sides.



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Workmen at Hawker's Langley facility mate the starboard wing to a Tempest II (PR747) fuselage. The wing mounted Hispano cannons have not been installed and all the forward fuselage access panels have been removed.

Once the wings were installed, the landing gear was drop tested. Included in the landing gear checks was ease of retraction, retraction and extension within a specified time, wheel braking and the fit of all doors when in their closed positions.



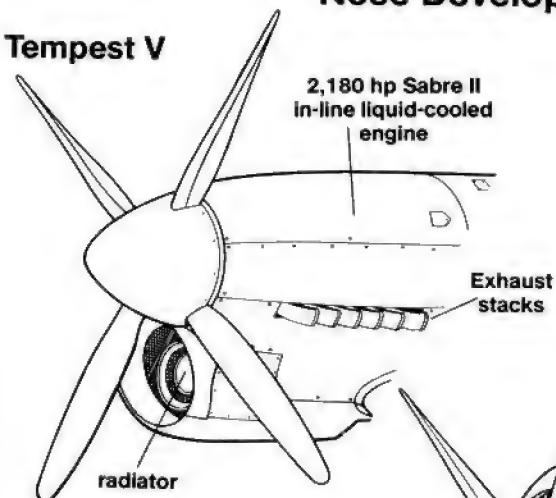
Tempest IIs in the Far East

While the plans for Tiger Force were cancelled, it was in the Far East that the Tempest II was to see its longest period of service. Two aircraft had been dispatched to India during June of 1945 and, beginning in December of 1945, a total of 180 aircraft were delivered to the RAF in India. These aircraft were used by four squadrons, Nos 5, 20, 30 and 152. These units flew patrols supporting the gradually dwindling British presence in India during the period immediately before the partition of India. While most missions were of a show the flag nature, they occasionally fired rockets against hostile tribes that threatened far flung British garrisons. All four squadrons disbanded between December of 1946 and July of 1947. During their last weeks on the Indian sub-continent personnel of No 5 Squadron organized a conversion course for pilots of the Royal Indian Air Force (RIAF). Nos 3 and 8 Squadrons of the RIAF took over all remaining RAF Tempest IIs in India by 15 August 1947.

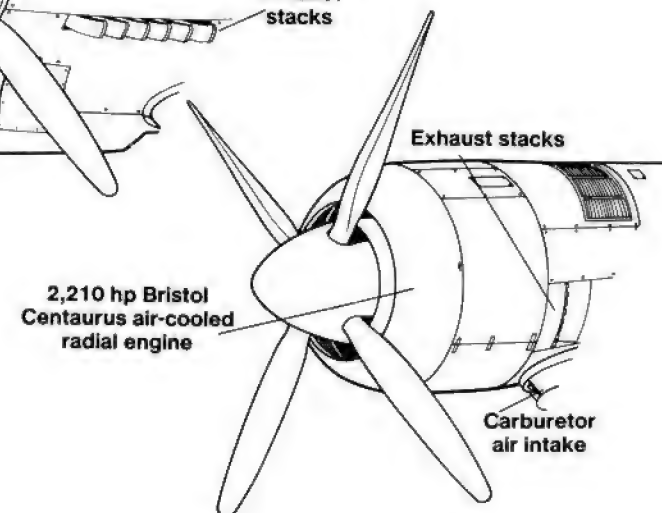
The last RAF unit to use the Tempest II in the Far East was No 33 Squadron, which brought its aircraft to Changi, Singapore (from Germany) to support Operation FIREDOG, the RAF's anti-guerrilla campaign against the communists in Malaya. Establishing its base at Butterworth, Malaya, the squadron began operations on 16 August 1947. It flew rocket and cannon strikes against communist lines of communications, villages, supply dumps and camps until 6 June 1951. On that date, the last combat sortie by a Tempest in RAF service was flown.

Nose Development

Tempest V



Tempest II





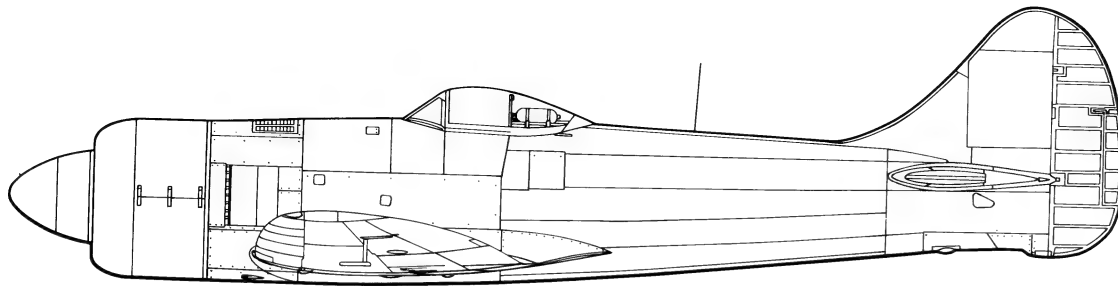
One of No. 33 Squadron's Tempest IIs (PR784) occupies a hangar at Fassberg, Germany. These aircraft carried their serial numbers in Black on the wing undersurface and part of the number can be seen on the wheel well door.



This Tempest II (PR901) of No 26 Squadron was also based at Fassberg, Germany. The front half of the spinner and drop tank tips are believed to be Red. This Tempest is configured with double rocket rails.

Tempest IIs saw extensive service in Germany as part of the RAF's Occupation Force. These rocket armed Tempest IIs, parked on the ramp at Fassberg, Germany, during May of 1947 are assigned to No 33 Squadron.

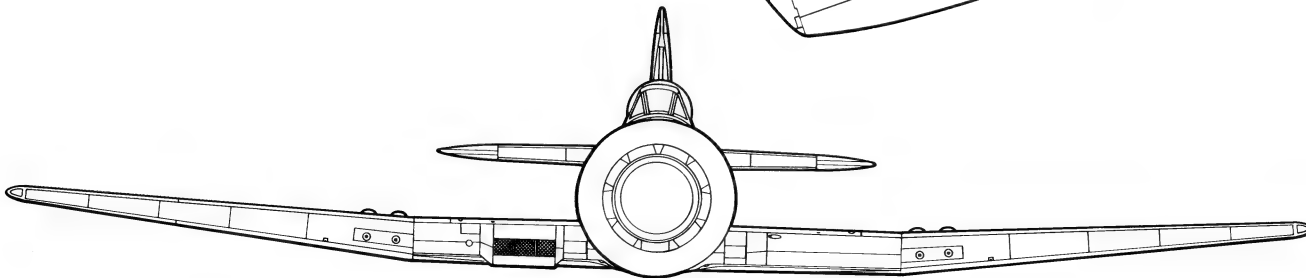
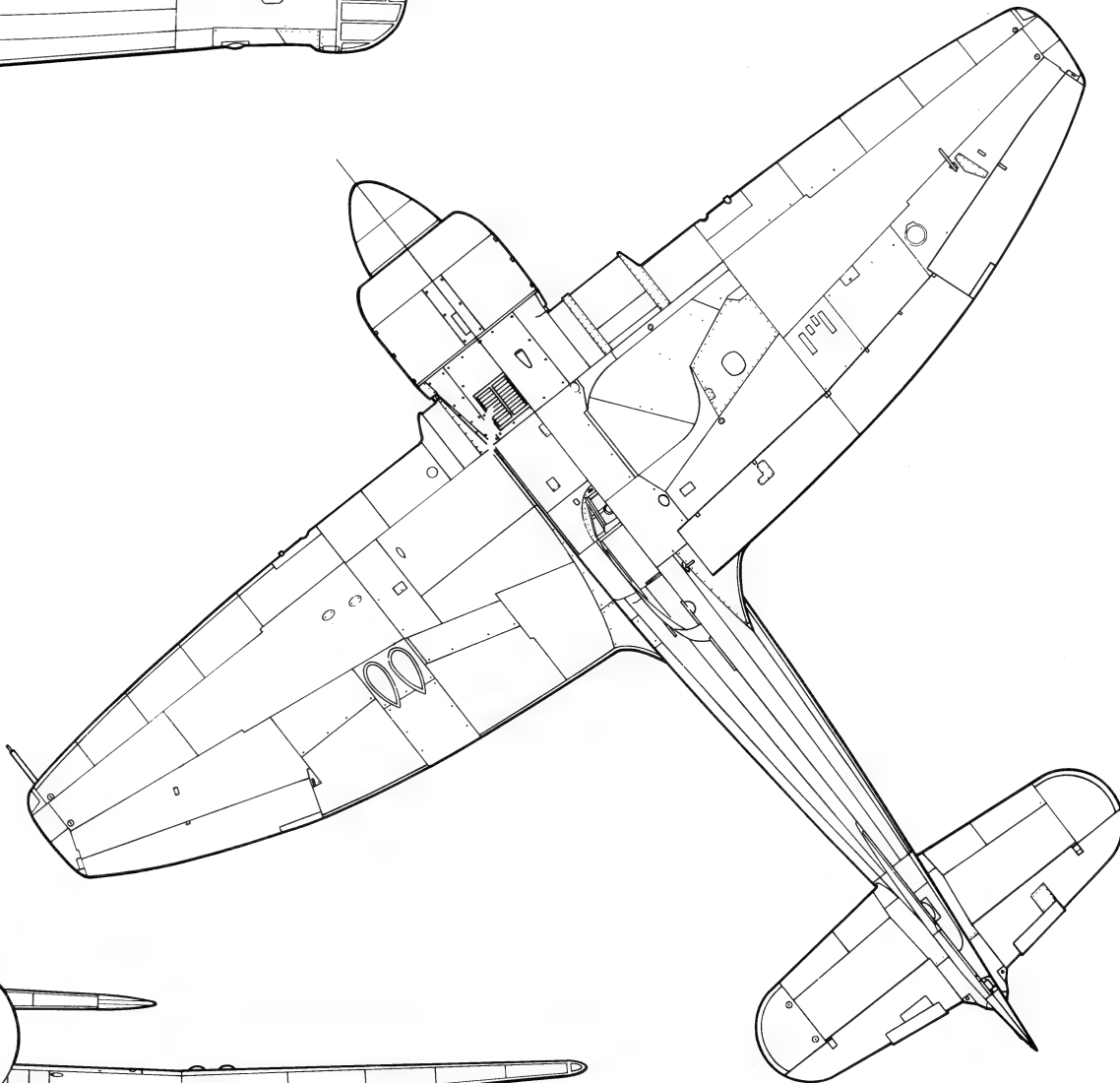




Specifications

Hawker Tempest Mk II

Wingspan	41 feet
Length	34 feet 5 inches
Height	14 feet 6 inches
Empty Weight	9,300 pounds
Maximum Weight	13,800 pounds
Powerplants	One 2,210 hp 18 cylinder Bristol Centaurus V air cooled radial engine.
Armament	Four Hispano Mk V 20mm cannons. Two 1,000 pound bombs or eight 60 pound rockets.
Performance	
Maximum Speed	440 mph
Service ceiling	37,500 feet
Range	805 miles
Crew	One





No 29 Squadron used a small style of identification codes on their Tempest IIs in India. The aircraft serial PR894 is painted on the underside of the wing in Black to aid in identification of low flying aircraft from the ground.



Tempest IIs also saw considerable service in the Far East and Middle East during the late 1940s. This Tempest II (PR836/Q) was based in India during 1946.

No 20 Squadron, also based in India, used larger identification code letters on their Tempest IIs, such as PR681. The aircraft spinner is painted in White.





When the RAF departed India, surplus Tempest IIs were turned over to the Royal Indian Air Force. This RIAF Tempest II (PR842, formerly of No 322 Maintenance Unit) still carries its RAF markings and was ground looped by its RIAF pilot at Chakeri, Cawnpore, India, during 1947.



A number of Tempest IIs were painted with Silver dope over the old camouflage paint. It was not uncommon for this paint to fade leading to a scruffy, worn appearance. Normally the aircraft individual identification letter on the fuselage was in Black.

A Tempest II (PR794) of No 5 Squadron. No 5 Squadron was responsible for training Royal Indian Air Force pilots on the Tempest II and began a conversion course for Indian pilots during early 1947.



This Tempest F II (PR747) was assigned to No 152 Squadron at Risalpur, India, during 1946 as part of the RAF's peace keeping force in India.



Tempest VI

While the vast majority of Typhoons was scrapped at the end of the Second World War, the Tempest V and VI enjoyed a useful post-war period of service. The Tempest Mk VI was basically a Tempest V airframe modified to accept the 2,340 hp Sabre V engine. The prototype Tempest VI was a modified Tempest V (HM595) (which had earlier served as the Mk V prototype). Externally similar to the Tempest V, the Mk VI featured wing root air intakes similar to those installed on the Tempest II. The use of wing air intakes, for the oil cooler and carburetor, left the nose area free to house a larger engine coolant radiator.

The Sabre V's higher power output made it necessary to have this extra cooling, which was especially important since the Tempest VI had been selected to be the standard RAF fighter for service in the Middle East. The need for better oil cooling had previously been revealed in tropical trials conducted using a Mk V (RJ841) modified to Mk VI standards and a production Mk V (EJ759). Additionally, a tropical air filter, similar to those fitted to the Typhoons tested in the Middle East, was positioned aft of the radiator as a separate fairing. The armament of four cannons was retained and a mix of drop tanks, rockets on zero length launchers and bombs could be carried.

The Tempest VI was kept in production primarily to give the engine manufacturers time to undertake postwar projects and ensure their economic survival. Total production was 142 aircraft, more than enough to equip five RAF squadrons. No 249 received its first aircraft at Habbaniya, Iraq during December of 1946. No 6 Squadron re-equipped at Nicosia on Cyprus during December. Nos 213 (also at Nicosia) and 8 at Aden, were re-equipped during January and March of 1947 respectively. The only other Tempest VI squadron was No 39 which temporarily replaced No 213 at Nicosia.

The final variant of Tempest series was the Mk VI. These aircraft differed externally from the Mk V by having wing leading edge air intakes for the oil cooler and carburetor. The Tempest VI prototype (HM595) was initially tested during February of 1945.



This production Tempest VI (NX135) served with both Nos 6 and 249 Squadrons before finally being sold as surplus during 1951.

Action soon followed the arrival of the Tempest VIs in the Middle East. Unrest in Aden, Iraq and Palestine in the turbulent post war years found the RAF holding the line pending political solutions to Britain's role in the area. Numerous ground attack sorties were flown in such diverse areas as Mogadishu in Italian Somaliland, and Eritrea in the Horn of Africa. It was over the emergent state of Israel that the last air combat for the Tempest was flown. These sorties were usually against former British aircraft flown by pilots who had been British allies a few short years ago. Casualties on both sides were mercifully few before the British Mandate ended and the RAF withdrew. By March of 1950 the Tempest VI had been replaced by Vampire jet fighters and had been withdrawn from RAF service.

Bearing the distinctive "flying can opener" unit insignia of No 6 Squadron on the chin intake, this Tempest VI (NX154) is parked on its dispersal site at Aden, on the Red Sea. The squadron also served on the island of Cyprus.





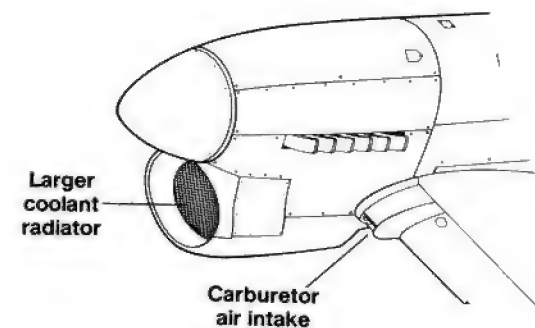
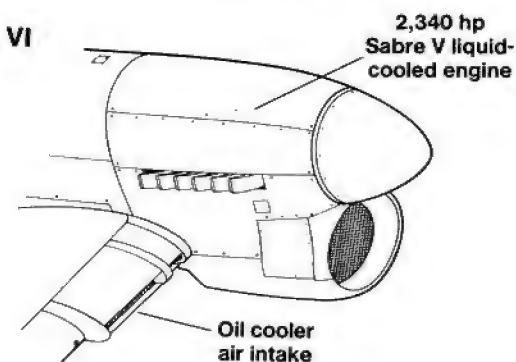
A Tempest Mk VI (NX229) of No 213 Squadron at Shallufa, Nicosia, on the island of Cyprus during October of 1947. Most Tempest VI squadrons served in the Middle East.



Squadron Leader Middlebrook was the pilot of this Tempest Mk VI assigned to No 6 Squadron at Deversoir during January of 1949. Painted in overall Aluminum dope, the aircraft carries Black squadron codes and the squadron badge on the nose.

Wing Intakes

Tempest VI



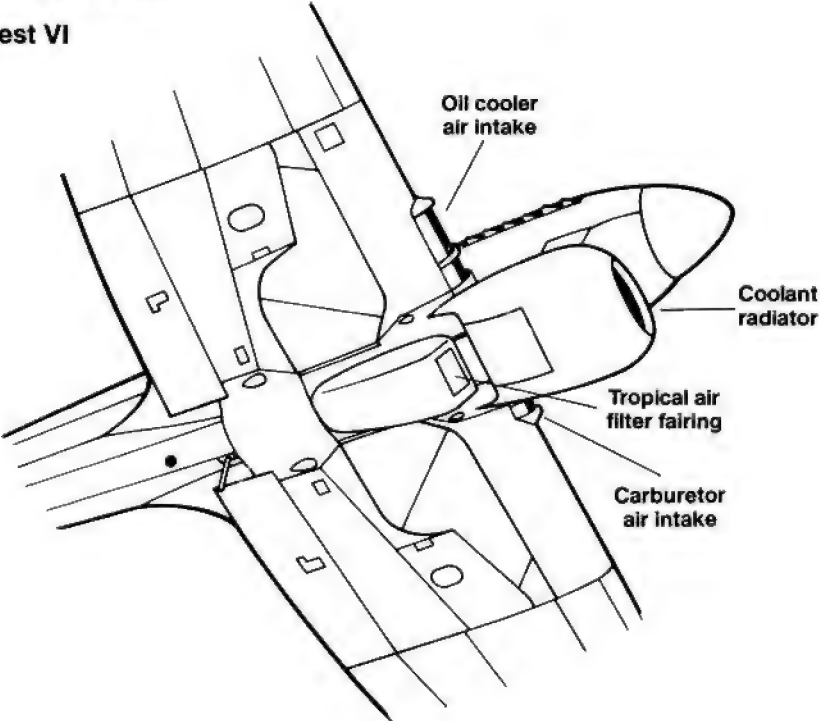
Ground crewmen work on a Tempest VI of No 80 Squadron. The men are aligning the four cannons of the Tempest to converge at a given range for ground attack missions.





This Tempest VI (NX264/G) was damaged in a ground collision with another Tempest VI (NX247/H) at Khartoum in the Sudan, on 24 January 1949. The aircraft was later declared unrepairable and scrapped.

Tropical Air Filter
Tempest VI



Colored squadron markings were used by some Tempest units during the early post war period. This Tempest Mk VI (NX204) has No 6 Squadron's light Blue "trellis" flash running down the leading edge of the fin.

The squadron codes on this Tempest VI (NX143) of No 249 Squadron are Red with a thin White outline. The squadron was based at Habbaniya, Iraq, during 1948.



Foreign Tempests

Although the Tempest quickly passed from RAF service once operationally ready jet equipment was available in quantity, other nations were to retain piston engined fighters for some years to come. Two countries received Tempests: India and Pakistan.

India

The first aircraft received were ex-RAF Tempest IIs passed on by squadrons departing India. Initially there were enough aircraft to equip three RIAF Squadrons. Nos 3, 8 and 10 Squadrons were formed before the end of 1946. No 4 Squadron received Tempest IIs after its return from Japan, where it had carried out Occupation Force duties flying Spitfires. By the time of the Partition of India, Nos 1, 7 and 9 Squadrons had also received Tempests. Upon partition, Nos 1 and 9 Squadrons passed thirty-five Tempests to Pakistan, leaving the Indian Air Force with five squadrons.

During October of 1947, trouble flared up in Jammu and Kashmir and for some fifteen months the Tempests were used in ground attacks against insurgent forces. The fighting ended on 1 January 1949, by which time India had received eighty-nine additional Tempest IIs direct from England. Twenty more were to be delivered from RAF stocks during 1951.

By January of 1950, India had become a republic and the armed forces dropped the Royal prefix with Nos 3, 4, 8 and 10 Squadrons of the Indian Air Force still flying Tempests. In the event, No 4 Squadron IAF, was the last to retire the Hawker fighter during the mid-1950s.

Pakistan

On 15 August 1947, Nos 5 and 9 Squadrons of the Royal Pakistani Air Force were formed with Tempest IIs. These squadrons were soon heavily engaged in operations against rebel tribesmen on the North West Frontier, with No 5 Squadron flying some forty-seven sorties. Expansion of the air force during 1949 saw delivery of another twenty-four Tempest IIs, allowing a third squadron, No 14, to be formed. Pakistan received a total of eighty Mk IIs, the original thirty-five aircraft being supplemented by an additional forty-five delivered from Hawker in two groups.

Pakistani Tempests were the last Tempests to remain in operational service. But by 1954, they finally had been replaced by another Hawker fighter, the Fury. Most of the Tempests were scrapped during 1958.



When India and Pakistan were partitioned, each country purchased fighters from Britain with India buying some ninety Tempest IIs. These new production Tempest IIs are part of an Indian order and carry the early style Indian Air Force roundel.

Pakistan purchased some forty-five Tempest IIs to equip three squadrons. This Pakistani aircraft is on the ramp at Langley, ready for delivery to Pakistan. PAF Tempests carried a Tan and Brown desert style camouflage.



Final Roles

Although the Tempest disappeared rapidly in England, a number of individual aircraft were employed in second line roles after the war. The most numerous were the Tempest TT Mk Vs target tugs. Eighty aircraft were refurbished by Hawker at Langley between February of 1950 and May of 1952 for the target towing role.

These aircraft were destined to be used by the Central Gunnery School, the Armament Practice Station (APS) at Ackington, Nos 226, 229 and 233 Operational Conversion Units, as well as the APS at Sylt, Germany. The tugs towed a standard RAF sleeve target or "flag" as it was called, suspended from pick up points under the fuselage. This method required the flag to be laid out on the ground prior to takeoff. Although tested, a streamlined fairing for carrying the target underwing and incorporating a wind driven winch, was not produced.

A number of Tempests had been used during the war years to test new weapons and equipment for the RAF and while some became standard, others remained interesting experiments. One experimental armament program involved the mounting of the 40MM Vickers 'P' gun under the wings of the Tempest. Housed in slim nacelles, one gun was hung from each Tempest underwing rack. The guns were tested on a Tempest Mk V (NV768) just after the end of the war. The tests revealed that the weapon had potential, but no production was undertaken.

In the United Kingdom, Tempest Vs were used for a brief time as target tugs. The Tempest TT Mk V (SN329) prototype was tested with a wind driven winch for the target mounted under the port wing and wire cable guards under the tail.

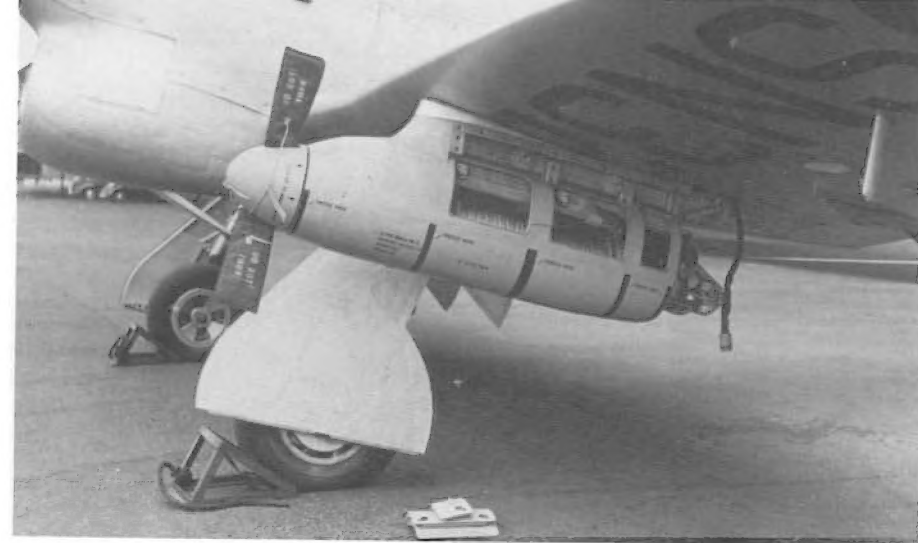
As part of the power plant testing, Napier had developed a unique annular radiator for use on the Tempest. The radiator development program used two modified Tempest V aircraft, serials EJ518 and NV768. NV768 was later fitted with a ducted spinner the same diameter as the fuselage and, although test flown, the spinner was not actually planned for use on production Tempests. Of the remaining Typhoon II mark numbers, the Mk I (HM599) was flown with a Sabre VI engine in a very close cowl and featured wing leading edge radiators. Neither feature was incorporated onto the Tempest production line and the aircraft was scrapped after the war.

Finally, the Tempest Mk III and IV, both earmarked for installation of Rolls-Royce Griffon engines, diverged significantly from the Sabre engined Tempest program. Only the Mk III prototype (LA610) was actually converted. The aircraft was test flown as a "lightweight" Tempest as part of a series of design studies that eventually led to the Hawker Fury and Sea Fury fighters.



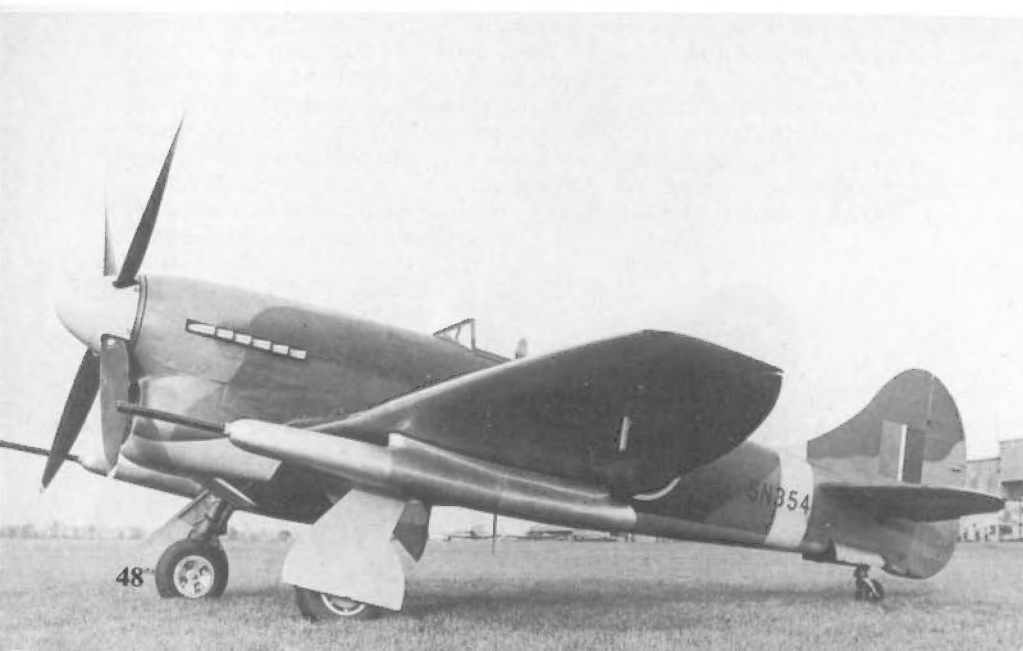


This Tempest TT Mk V (NV699) of No 229 Operational Conversion Unit (OCU) is painted in overall Aluminum dope with a Yellow fuselage band. The aircraft's undersurfaces are in Yellow with wide Black stripes.



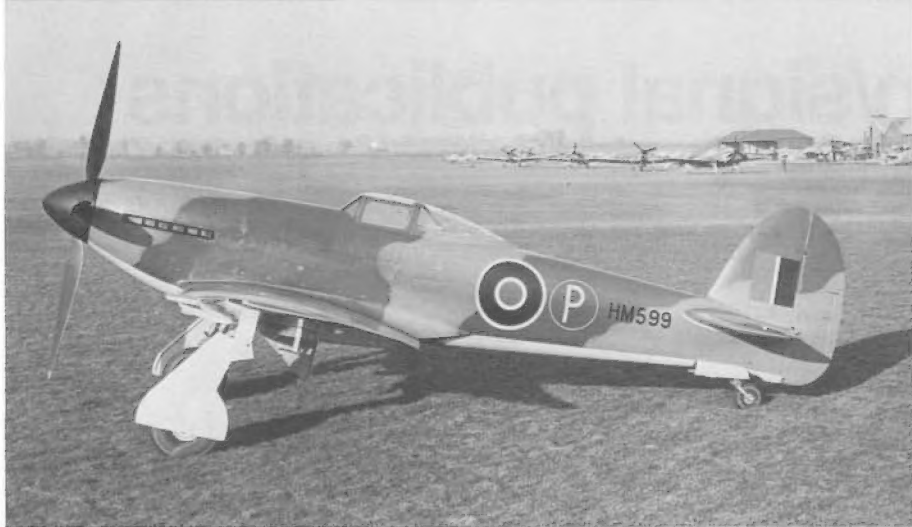
The compact winch and cable system was enclosed by a streamlined pod and carried under the port wing. The pod was counter balanced by a drop tank carried on the starboard wing. Although successful, the pod did not enter production.

Among the armament tests conducted with the Tempest was the Vickers 40 mm P gun. The large cannons were faired into slim, streamlined pods and carried on the bomb racks of the Tempest. This Tempest V (SN354) served as a weapons test bed for the firing trials of the cannon.

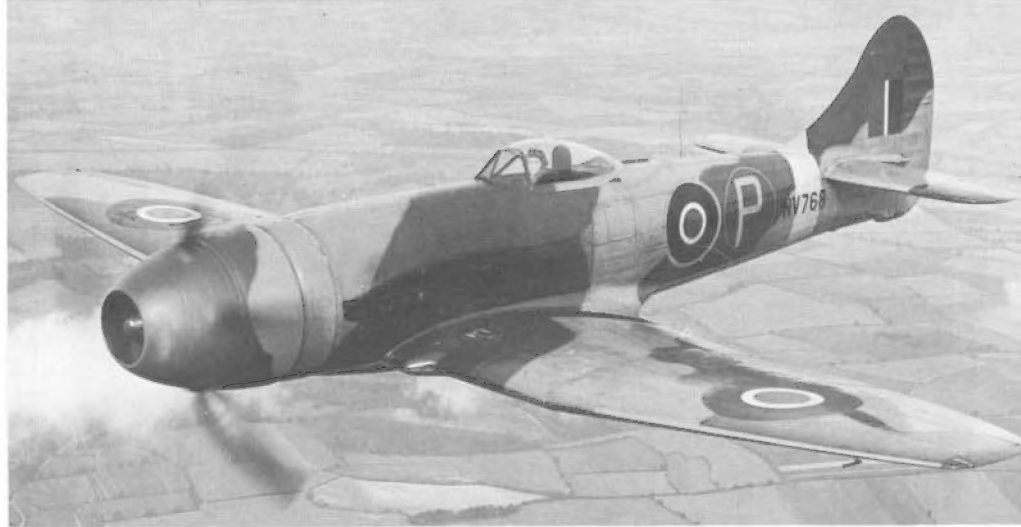


The Tempest Mk III was the last of the Tempest line and led to the RAF Fury and Royal Navy Sea Fury. Known as the Hawker F.2/43, the aircraft made its first flight during September of 1944 powered by a Griffon engine.





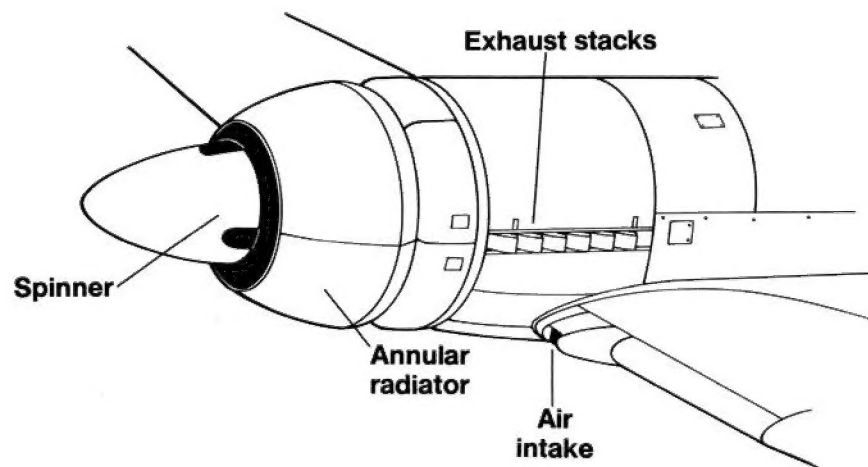
The prototype Tempest I (HM599) was modified with air intakes for the oil cooler and radiator in the wing leading edge. In the event these did not offer sufficient cooling for the engine and the project was cancelled.



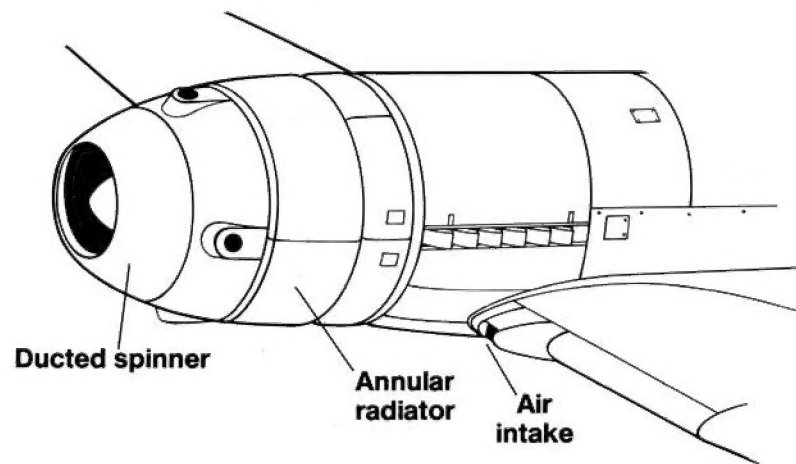
This Tempest (NV768) was fitted with a ducted spinner as part of the flight trials of Napier's annular radiator. In the event, this modification failed to live up to expectations and did not enter production.

Annular Radiator Tempest

Tempest V (EJ518)
Sabre VI engine

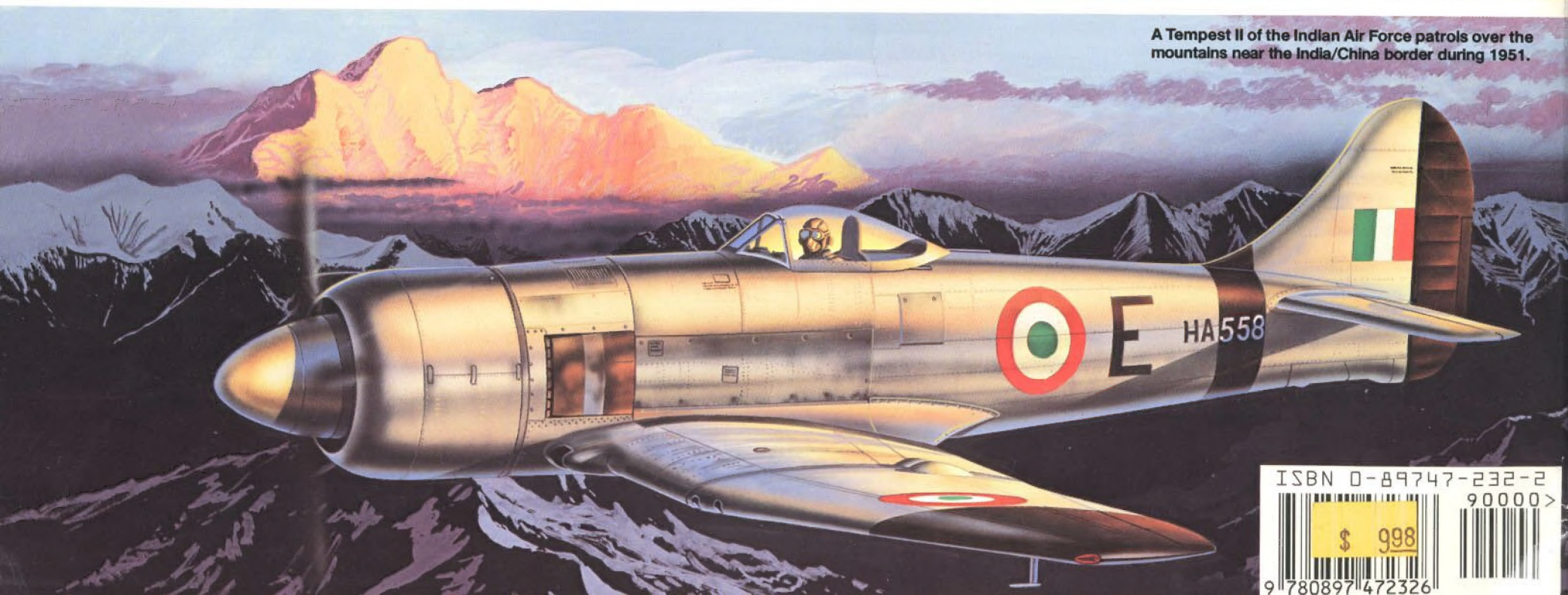


Tempest V (NV768)





The unfaired cannon barrels on this Typhoon IB of No 195 Squadron identify it as an early production aircraft. The Typhoon was flown by Squadron Leader Don Taylor.



A Tempest II of the Indian Air Force patrols over the mountains near the India/China border during 1951.

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